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Facebook's Effect on Emotional Reactivity to In-Lab Peer Feedback Manipulations

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Facebook's Effect on Emotional Reactivity to In-Lab Peer Feedback Manipulations

by

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Dissertation

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Dedication

For Kolajo (1980-2011), who never finished his doctorate.

I miss you.

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Josh: Thanks for helping me cross the finish line.

Facebook's Effect on Emotional Reactivity to In-Lab Peer Feedback Manipulations

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The University of Texas at Austin, 2016

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Peer feedback is a foundational currency on the social networking platform Facebook. Facebook users share photographs and personal updates their friends can then "like" or comment on – feedback often seen by users' friends. Negative peer feedback on Facebook can have severe consequences: media outlets have attributed teen suicides to bullying on Facebook, and some worry Facebook is dangerous for young people. While Facebook provides an additional channel for peer feedback, it is unclear whether feedback on Facebook, in the absence of face-to-face feedback, prompts emotional reactivity.

We conducted three studies investigating the emotional effects of Facebook-mediated peer feedback on university students. In each we measured affect and self-esteem before and after controlled manipulations of two factors: feedback valence and communication channel. In the first study, participants believed they were evaluated to determine whether they were "likeable". We compared participants' emotional reactivity to acceptance or rejection feedback (feedback valence) delivered after a peer evaluation manipulation occurring either on Facebook or face-to-face (communication channel). In the second study, participants were told they would join a group in determining the "most likeable" student amongst them. We compared participants' emotional reactivity to supportive or bullying feedback (feedback valence) delivered on Facebook either privately or publicly (communication channel). In this study we additionally measured changes in participants' perceptions of their own social status and the social status of the person

delivering feedback. In the third study, we tested whether demographic and psychosocial variables moderated the effects found in the second study.

We found no appreciable differences between face-to-face and Facebook-mediated feedback. Bullying on the Facebook Profile dampened self-esteem more than bullying through Facebook's private Messenger client, which had no appreciable effect on self-esteem. Moderation analysis revealed that only people reporting depressive symptoms indicated that bullying on the Facebook Profile dampened their self-esteem. These results suggest Facebook does not itself amplify or blunt the emotional effects of peer feedback, and instead confirms the important role individual differences play in emotional reactivity. Individual and environmental triggers of emotional reactivity, such as psychosocial vulnerabilities and sociometric status, may remain the best targets for reducing the negative effects of peer victimization.

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Introduction

Peer feedback is a foundational currency on the social networking platform Facebook. Facebook users share photographs and personal updates their friends can then choose to "like" or comment on – semi-public feedback often seen by users' friends. Friends can also provide private feedback through a private messaging channel. When peer feedback on Facebook turns negative, the consequences can be severe: media outlets have attributed teen suicides to bullying on Facebook, and some worry social media platforms like Facebook are dangerous for young people (Arkell, 2013; Gayle, 2013). While Facebook provides an additional channel for peer feedback, the degree to which feedback on Facebook alone, in the absence of face-to-face feedback, prompts negative emotional reactivity is unknown. We conducted three studies to explore Facebook's effects on emotional reactivity to peer feedback. In Study 1, we compared emotional reactivity to acceptance and rejection feedback delivered after a peer evaluation manipulation either on Facebook or face-to-face. In Study 2, we compared emotional and sociometric reactivity to supportive or bullying feedback delivered on Facebook through either a private or a public channel. In Study 3, we tested whether demographic and psychosocial variables moderated the effects of the feedback manipulation in Study 2.

Most people are motivated to manage their self-presentation (Goffman, 1959; Baumeister & Leary, 1995). Facebook users maintain their online self-presentation by sharing content with a chosen social network. Peer feedback about shared content is sometimes visible to users' networks, making feedback part of user self-presentation. Because people are particularly concerned about public self-presentation (Leary & Kowalski, 1990), Facebook users are likely invested in their self-presentation, and research suggests they are reactive to feedback about it. The amount of feedback new Facebook users receive predicts increased in the future (Burke, Marlow & Lento, 2009). Moreover, feedback on Facebook users' Profiles affects others' opinions of them (Walther et al.,

2008). Finally, self-awareness, which can be increased by looking at one's own Facebook Profile, increases reactivity to rejection feedback (Gonzales & Hancock, 2011; Fenigstein, Scheier, & Buss, 1975).

Feedback about self-presentation is common to both face-to-face and Facebook-mediated interaction, but communication through each format is functionally different. Face-to-face communication requires management of both verbal and non-verbal (e.g., vocal tone, gesture) content, typically requires an immediate response, and thus demands instantaneous processing of large amounts of social information. In contrast, Facebook-mediated communication allows limited verbal and visual content, and, because content is recorded, users can interact at their own pace and revisit correspondence over time. Facebook users therefore have greater control over content they share.

Multiple psychological theories (e.g., Averill, 1973; Bandura, 1988; Dweck & Leggett, 1988) suggest perceived control reduces emotional reactivity. Experimental research supports this hypothesis (Sanderson, Rapee & Barlow; 1989; Telch et al., 1994). Because people have increased control over Facebook-mediated communications, they should be less reactive to feedback about their Facebook self-presentation than to feedback about their face-to-face self-presentation. Facebook users can deliberately surface flattering content (Walther, Slovacek, & Tidwell, 2001), which may lead them to attribute Profile feedback about their Profile to their self-presentation efforts, rather than to their self (Manago, Graham, Greenfield, & Salimkhan, 2008). Further, Facebook users may expect that modifying their Profile could influence what feedback they receive.

Although increased control over self-presentation on Facebook could dampen emotional reactivity to peer feedback, Facebook's semi-public nature could conversely heighten it. People are more concerned about public self-presentation than private self-presentation (Leary & Kowalski, 1990), and react more strongly to public feedback than they do to private feedback (Leary, Cottrell, & Phillips, 2001). Peer feedback posted on users' Facebook Profiles is often visible to users' social networks, and users may anticipate

that such feedback could have greater social consequences than feedback shared privately through Facebook's messaging channel, where only the sender and receiver can see it (Kowalski & Limber, 2007; Nocentini et al., 2010). People further may feel less control over public peer feedback as they may not be able to manage information diffusion (Sticca & Perren, 2012). As a result, Feedback posted on users' Facebook Profiles may prompt more emotional reactivity than the same feedback shared privately through Facebook Messenger.

Understanding Facebook's effects on emotional reactivity to peer feedback is of primary importance when considering the negative effects of online peer victimization, or cyberbullying. Cyberbullying is willful and repeated harm inflicted through computer-mediated communication (Burgess-Proctor, Hinduja & Patchin, 2009; Patchin & Hinduja, 2006), and up to 23% of adolescents may be victims of cyberbullying (Schneider, O'Donnel, & Smith, 2015). The psychosocial correlates of cyber-victimization include anxiety (e.g., Dempsey, Sulowski, Nichols & Storch, 2009), reduced self-esteem (e.g., Houlston, Smith & Jessel, 2011; Patchin & Hinduja, 2010), and depression (e.g., Sontag, Clemens, Graber & Lyndon, 2011; Ybarra, 2004). In the wake of highly-publicized teen suicides, some have questioned whether social media platforms like Facebook have made cyberbullying easier for perpetrators and more damaging to its victims (Arkell, 2013; Gayle, 2013).

To understand Facebook's effect on emotional reactivity, we used feedback challenges, experimental manipulations known to prompt emotional change. In a feedback challenge, participants are led to believe they have been evaluated and are then given scripted feedback. A meta-analysis of 192 social rejection studies found that experimentally manipulated face-to-face feedback, such as that used in a feedback challenge, prompts emotional reactivity (Blackhart et al., 2009). In our research with children, computer-mediated rejection following evaluation of an online Profile decreased self-esteem, whereas acceptance increased self-esteem (Reijntjes, Stegge, Terwogt,

Kamphuis, & Telch, 2006a, 2006b; Thomaes et al., 2010). Thus, both face-to-face and computer-mediated feedback prompt emotional change, but research comparing the two is inconclusive. Although early research found no appreciable difference between reactivity to face-to-face and computer-mediated interaction (Kiesler, Zubrow, Moses, & Geller, 1985), subsequent research suggests computer-mediated communication may reduce reactivity to social exclusion (Williams et al., 2002). Feedback manipulation research further suggests people react more strongly to public feedback than to private feedback (Leary, Cottrell, & Phillips, 2001), although this has not been tested using any form of computer-mediated communication including social networking platforms like Facebook.

Demographic and psychosocial variables such as gender, fear of negative evaluation, and depressive symptoms could further moderate any effects of Facebook on emotional reactivity. Research suggests that women respond differently to rejection feedback than do men. Compared to men, women are more reactive to private rejection feedback, and preadolescent girls anticipate more negative affect in response to rejection (Romero-Canyas & Downey, 2005; Reijntjes, Stegge & Terwogt, 2006). Women are also more likely to experience depression in response to bullying feedback (Sapouna & Wolke, 2013). Fear of negative evaluation, a risk factor for social anxiety (Friend & Gilbert, 1973; Smith & Sarason, 1975; Watson & Friend, 1969), may also moderate Facebook's effect on emotional reactivity. People with high fear of negative evaluation are concerned about how they are perceived by others and should experience a stronger response to public feedback, which could be seen by many, than to private feedback (Clark & Wells, 1995). Because people with high fear of negative evaluation are more sensitive to non-verbal cues of rejection, they should be more reactive to face-to-face rejection than they are to Facebook-mediated rejection (Winton, Clark, & Edelmann, 1995).

Depressive symptoms, which are associated with exaggerated distress in response to rejection and decreased ability to cope with it, could also moderate Facebook's effect on emotional reactivity. In research with children, we found that those reporting depressive

symptoms anticipated more distress when imagining a rejection scenario. These children were also less likely to endorse effective coping strategies to manage their reaction to rejection (Reijntjes, Stegge, Terwogt, Kamphuis, & Telch, 2006). Further, research on online social comparison indicates that people who compare themselves to others when using Facebook report more depressive symptoms and more negative self-views (Feinstein et al., 2013; Haferkamp & Krämer, 2011) compared to peers. As public feedback is likely to prompt more social comparison concerns, it would be expected to prompt reactivity amongst vulnerable populations such as those with social anxiety or depression (Antony et al., 2005; Bäzner, Brömer, Hammelstein, & Meyer, 2006).

Research has explored how Facebook may be used to evaluate others and its effects on self-presentation behavior (Forest & Wood, 2012; Back et al., 2010), self-disclosure (Jiang, Bazarova, & Hancock, 2011), and peer perceptions after feedback (Walther et al., 2008). However, we are unaware of any experimental research investigating how Facebook-mediated feedback affects emotional reactivity.

We conducted three studies comparing the emotional effects of Facebook-mediated peer feedback on university students. In all studies we measured state positive and negative affect and state self-esteem before and after the delivery of controlled manipulations of two factors: *feedback valence* and *feedback channel*. Study 1 consisted of two experiments in which participants were told they would be evaluated to determine whether they were "extremely likeable". We compared emotional reactivity to acceptance or rejection feedback (feedback valence) delivered after a peer evaluation manipulation taking place either on Facebook or face-to-face (evaluation channel). In Study 2, participants were told they would be joined by a group of confederates in evaluating one another to determine the "most likeable" student. We compared emotional reactivity to supportive or bullying feedback (feedback valence) delivered on Facebook through either a private or a public channel (feedback channel). In Study 2, we also measured changes in participants' perception of their own sociometric status and that of the person delivering feedback. In

Study 3, we tested whether demographic and psychosocial variables like gender, fear of negative evaluation, and depressive symptoms moderated the effects of the feedback manipulation found in Study 2.

Study 1: Facebook Reduces Self-Esteem Reactivity to Social Evaluation and Peer Feedback

Research suggests computer-mediated peer feedback following evaluation of an online Profile causes self-esteem reactivity (Reijntjes, Stegge, Terwogt, Kamphuis, & Telch, 2006a, 2006b; Thomaes et al., 2010), but it is unclear how this reactivity compares to that following face-to-face feedback. In two experiments with university undergraduates, we compared the effects of Facebook-mediated and face-to-face evaluation and feedback. We measured state positive and negative affect and state self-esteem before and after the delivery of controlled manipulations of three factors: feedback valence, evaluation channel, and feedback channel.

SPECIFIC AIMS AND HYPOTHESES

To understand how Facebook-mediated evaluation and feedback affect emotional reactivity compared to face-to-face evaluation and feedback, we compared the effects of Facebook-mediated and face-to-face evaluation and feedback in two experiments with university undergraduates.

Hypothesis 1 – Because people have increased control over Facebook-mediated communications, they should be less reactive to feedback about their Facebook self-presentation than to feedback about their face-to-face self-presentation (see Sanderson, Rapee & Barlow; 1989; Telch et al., 1994). We expected participants would exhibit an increase in state negative affect after rejection feedback and an increase in state positive affect and state self-esteem after acceptance feedback, and that these feedback effects would be more pronounced when the evaluation channel was face-to-face versus online. This hypothesis was tested in Study 1, Experiments 1 and 2.

Hypothesis 2 – Computer-mediated communication may reduce reactivity to social exclusion (Williams et al., 2002). As a result, we predicted that feedback delivered through Facebook Messenger would buffer reactivity to feedback compared to feedback delivered

face-to-face. We also predicted that face-to-face (vs. Facebook-mediated) feedback would further amplify the hypothesized interaction between feedback valence and evaluation channel. This hypothesis was tested in Study 1, Experiment 2.

METHODS

The research design for this study was reviewed and approved by The University of Texas at Austin (UT) Institutional Review Board (IRB) (protocol #2010-12-0007).

Sample Recruitment

Participants between the ages of 18 and 24 were recruited from The University of Texas' introductory Psychology subject pool and participated for course credit. Random assignment to one of the four (Study 1, Experiment 1) or eight (Study 1, Experiment 2) treatment groups in Study 1 was done using a random number generator. Table 1 presents the recruitment criteria approved by the IRB.

Because our experimental manipulation was hypothesized to prompt short-term distress, individuals were excluded for their protection if they reported clinical symptoms of suicidality. All participants completed a computer-adapted version of the Suicidality module of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997) during the in-lab screening survey. Individuals excluded for this reason were provided immediate face-to-face support by trained clinicians through the Clinical Psychology area of the UT Psychology Department. Participants in Study 1, Experiment 1 (n=3) and Study 1, Experiment 2 (n=1) reporting suicidal ideation were excluded from participation.

Fear of negative evaluation (FNE) was hypothesized to be a likely moderating trait variable and levels of FNE as measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983) were considered during participant recruitment. For both experiments, we recruited participants who were stable on FNE at three time points (twice online and once in the laboratory during the pre-experiment screening questionnaire). For

Study 1, Experiment 1, we recruited undergraduates who consistently scored either one standard deviation above (high) or below (low) the recruiting pool mean (m=35.67, sd=10.71). To facilitate recruitment for Study 1, Experiment 2, we also included students who consistently scored between one standard deviation above and below (average) the recruiting pool mean (m=36.47, sd=9.79). Mean FNE scores were similar between Study 1, Experiment 1 and Study 1, Experiment 2 (p>.100). Tables 10 and 16 present FNE scores by group. We included FNE as an intercept-level covariate when we conducted model selection.

Table 1: Recruitment Criteria for Study 1, Experiments 1 and 2

Inclusion
1. Between 18 and 24 years old
2. Fluent in English
3. Available to attend experiment at The University of Texas at Austin campus
4. Possess an active Facebook.com Profile
5. Willing to accept five temporary friend requests for the duration of the experiment (one Profile used by the experimenter, four Profiles used by the confederate evaluators)
6. Stable score on the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983) (for participants in Study 1, Study 1, Experiment 1, score must be either above or below one standard deviation from the recruitment sample mean
Exclusion
1. Ineligible according to the above points
2. Qualification for Suicidality on a computer-adapted version of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997) during the in-lab screening

Research Design and Sample Size Selection

Study 1 included two experiments. In Study 1, Experiment 1, participants were randomly assigned to one of four conditions. Two two-level factors (evaluation channel, feedback valence) were completely crossed, and all possible conditions have been reported. Figure 1 depicts the experimental design for both experiments. Table 1 presents the number of participants who were recruited and participated in the research study, and the number of participants included in the final sample.

Our initial analytic strategy was to conduct an analysis of covariance (ANCOVA) using residualized change scores to measure the effects of the experimental factors on affect and self-esteem. A priori power analyses ($f = 0.25$, alpha = .05, power = 0.80) using G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that a sample of 128 subjects (32 per group) was sufficient to identify medium effects using ANCOVA. After one academic semester, however, we terminated data collection to expand the design of the project (see Study 1, Experiment 2).

In addition to terminating data collection early, we subsequently changed our analytic strategy to use linear mixed effects regression (LMER; Bates, Machler, Bolker, & Walker, 2014) instead of residualized change ANCOVA. We conducted a post-hoc power simulation ($n = 10{,}000$) using R v. 2.15.2 (R Core Team, 2012) to determine the power of our final sample ($n = 74$) to identify medium (d = .5, alpha = .05, power = .31) and large (d = 1, alpha = .05, power = .62) two-way interaction effects using LMER. Our study was thus underpowered to detect the hypothesized interaction effects, but was powerful enough to identify main effects sized medium and greater (d = .5, alpha = .05, power = .98).

Table 2: Number of participants included in final analysis (and number of participants recruited) for Study 1, Experiment 1

	Feedback Valence	
	Acceptance	Rejection
Facebook	27(*34*)	14(*15*)

Table 3: Number of participants included in final analysis (and number of participants recruited) for Study 1, Experiment 2

	Feedback Channel			
	Face-to-face		Facebook	
	Feedback Valence			
	Acceptance	Rejection	Acceptance	Rejection
Evaluation Channel				
Face-to-face	20(*21*)	16(*24*)	20(*24*)	22(*24*)
Facebook	17(*23*)	18(*19*)	22(*26*)	17(*21*)

Face-to-face 18(21) 15(19)

In Study 1, Experiment 2, participants were randomly assigned to one of eight conditions. Three two-level factors were completely crossed, and all possible conditions have been reported. Figure 1 depicts the experimental design for both experiments. Table 3 presents information about the number of participants recruited and included in the final sample.

As with Study 1, Experiment 1, our initial analytic strategy was to conduct an ANCOVA using residualized change scores to measure the effects of the experimental factors on affect and self-esteem. A priori power analyses (f = 0.25, alpha = .05, power = 0.80) using G*Power software (Faul et al., 2007) indicated that a sample of 128 subjects (16 per group) was sufficient to identify medium or larger effects using ANCOVA. We met this criterion after one and a half semesters, and continued data collection until the semester's end to increase power.

Because we subsequently changed our analytic strategy to use LMER instead of residualized change ANCOVA, we simulated a post-hoc power simulation (n = 10,000) using R to determine the power of our final sample size (n = 152) to identify medium (d = .5, alpha = .05, power = .53) and large (d = 1, alpha = .05, power = .90) two-way interaction effects, and medium (d = .5, alpha = .05, power = .15) and large (d = .5, alpha = .05, power = .36) three-way interaction effects using LMER. As in Study 1, Experiment 1, power to detect main effects exceeded .80.

PARTICIPANTS

Study 1, Experiment 1

Ninety-two (92) undergraduate Facebook users (59 females; 57 Caucasian) between 18 and 24 (*m*=19.13) reporting high or low scores (+/- 1 SD from the subject pool mean) on the Brief Fear of Negative Evaluation scale (Leary et al., 1989) were recruited from The University of Texas' introductory Psychology subject pool and participated for course credit.

Study 1, Experiment 2

One hundred and eighty three (183) undergraduate Facebook users (93 female; 95 Caucasian American) between 18 and 24 (*m*=18.67) participated for course credit. Unlike Study 1, Experiment 1, participants scoring between 1 SD above and below the subject pool mean on the Brief Fear of Negative Evaluation scale (Leary et al., 1989) were also included.

MEASURES

To assess short-term reactivity to the manipulations described below for both experiments, participants completed measures of state affect (Positive and Negative Affect Schedule-X; Watson, Clark, & Telegen, 1988) and self-esteem (State Self-Esteem Scale; Heatherton & Polivy, 1991) before and after the manipulation. Information on age, gender, and fear of negative evaluation were collected before the manipulation. Age and gender were provided by the participants. Fear of negative evaluation was measured using the Brief Fear of Negative Evaluation scale (BFNE; Leary, 1983). Following the experimental manipulation, participants answered three 5-item Likert scales measuring how likable, attractive, and relatable participants found each evaluator. Following the debrief, we measured participants' belief in the manipulation using a 5-point Likert scale. A full list of measures administered during the study is included in Table 4.

Table 4: Measures collected for Study 1, Experiments 1 and 2

Screening
Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1998)
Suicide Module of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997)

Pre-Manipulation
Profile of Mood States (Curran, Andrykowski & Studts, 1995)
Positive and Negative Affect Schedule (Watson, Clark & Tellegen, 1988)
State Self-Esteem Scale (Heatherton & Polivy, 1991)
Beck Depression Inventory-II (Beck, Steer & Brown, 1996)
Satisfaction With Life Scale (Pavot & Diener, 2009)
University of California, Los Angeles Loneliness Scale (Russell, 1996)
Revised Cheek & Buss Shyness Scale (Cheek, 1981)
Measure of Online Communication Attitudes (Ledbetter et al., 2010)
Preference for Online Social Interaction (POSI; Caplan, 2003)
Problematic Internet Use (Caplan, 2002)
Facebook Use Questionnaire (Valkenburg & Peter, 2009)
Facebook Intensity Scale (Ellison, Stienfield & Lampe, 2007)
Facebook Communication Measure (Ledbetter et al., 2010)
Facebook User Perceptions (Ellison, Stienfield & Lampe, 2007)
Facebook Strong Ties Item (Developed for this study)
Facebook Privacy Items (Developed for this study)
Facebook Motives (Sheldon, 2008)
Evaluation Channel Preference Item (Developed for this study)
Evaluation Channel Expectancy Item (Developed for this study)
Screening Anxiety Item (Developed for this study)

Post-Evaluation
Post-Interview/Facebook Performance Estimation Questions (Developed for this study)
Evaluator Rating Items (Developed for this study)

Post-Feedback
Profile of Mood States (Curran, Andrykowski & Studts, 1995)
Positive and Negative Affect Schedule (Watson, Clark & Tellegen, 1988)
State Self-Esteem Scale (Heatherton & Polivy, 1991)
Evaluator Rating Items (Developed for this study)

Post-Debrief
Manipulation Check Item (Developed for this study)
Diffusion Check Items (Developed for this study)

PROCEDURES

Study 1, Experiment 1

Overview

After completing pre-manipulation measures, the experimenter told participants that four undergraduate research assistants (RAs; 2 female) would determine their eligibility for research on "extremely likable and charismatic" students. Participants were randomly assigned an evaluation channel (face-to-face or Facebook-mediated) and a feedback valence (acceptance or rejection). All participants in Study 1, Experiment 1 received feedback face-to-face. The resulting 2x2x2 experimental design included two between-group fixed factors (evaluation channel, feedback valence) and one within-subjects fixed factor (time). Figure 1 depicts the experimental design for Study 1, Experiments 1 and 2.

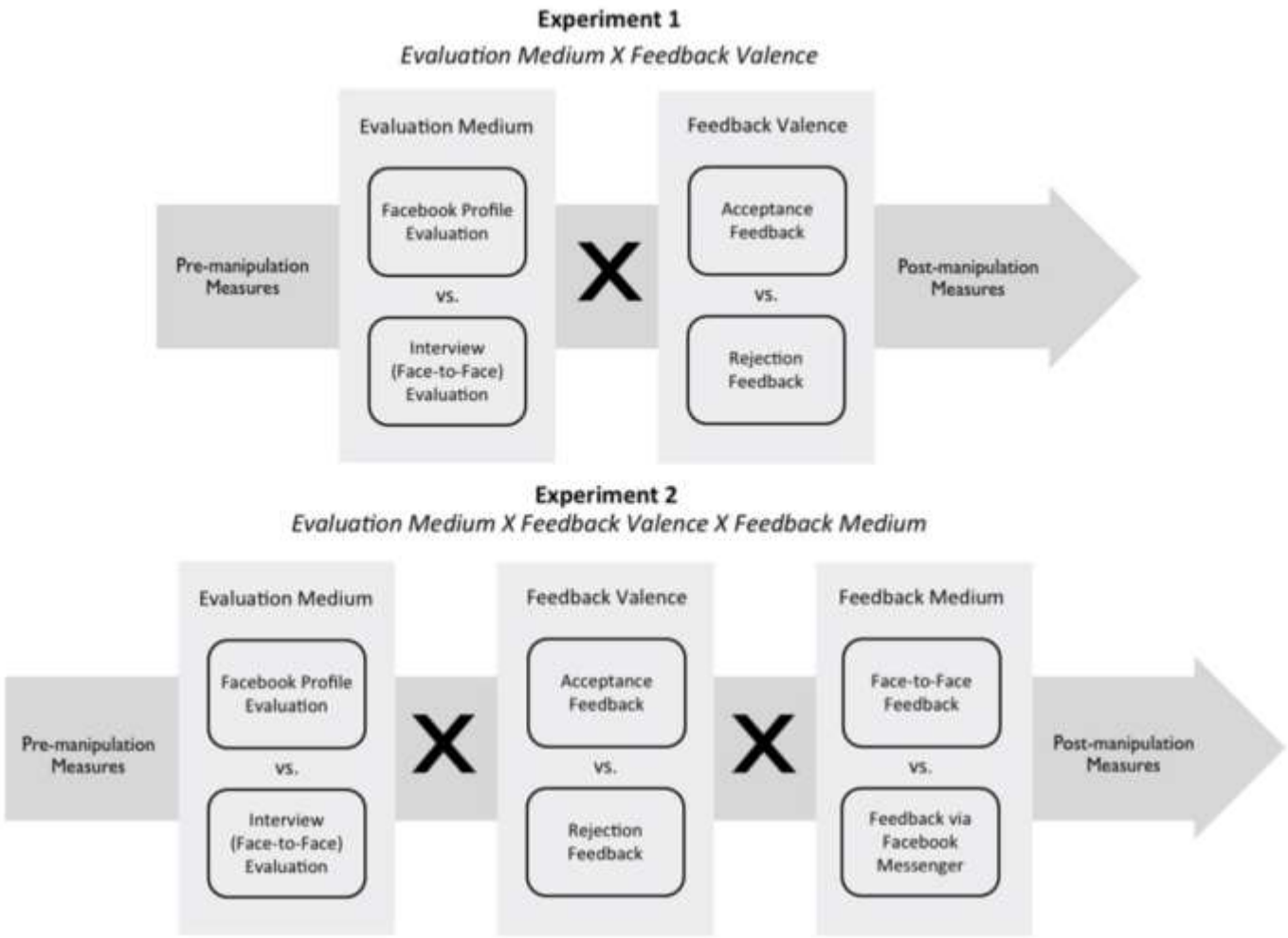


Figure 1: Experimental design for Study 1: Study 1, Experiments 1 and 2.

The experimenter consented participants face-to-face and prompted them to remain signed into Facebook during the experiment. An RA responsible for random assignment blinded both experimenter and evaluators to condition assignment until the experimenter needed the information to continue with the manipulation.

After completing pre-manipulation measures, participants were told they would be evaluated to determine their likability. Participants assigned to the Facebook evaluation condition were told their Profile would be evaluated, and were instructed to become Facebook "friends" with each of the four evaluators. Participants assigned to the face-to-face evaluation condition were told they would be evaluated by face-to-face interview and were introduced to the four evaluators in a separate room. To ensure participants in both conditions received equivalent information about the evaluators, evaluators introduced themselves during the face-to-face evaluation using the same content shared in their Facebook Profiles. To encourage engagement with evaluators from participants in both conditions, Facebook-evaluated participants were instructed to spend the evaluation period browsing each evaluator's Profile, and all participants were told they would be asked about the evaluators later in the study.

After the five-minute evaluation manipulation, the participants were told the RAs were determining the participant's likability. During this five-minute period, participants answered questions about each evaluator. Because participants' feelings towards evaluators could influence reactivity, we included three 5-item Likert scales (0=*not at all* to 4=*extremely*) measuring how likable, attractive, and relatable participants found each evaluator. Higher scores reflected stronger affinity towards the evaluator (Cronbach's a=.85).

The experimenter next entered the participant's room, verbally delivered (face-to-face) the assigned feedback (acceptance or rejection), and informed participants that data collection would begin. Accepted participants were told that they were "a great fit for the likability group" and that they would begin the likability study. Rejected participants were

told they were "not a good fit for the likability study" and that they would begin "another study on social functioning" instead. After participants completed post-manipulation measures, they were immediately debriefed and then rated their belief in the manipulation using a 5-point Likert scale.

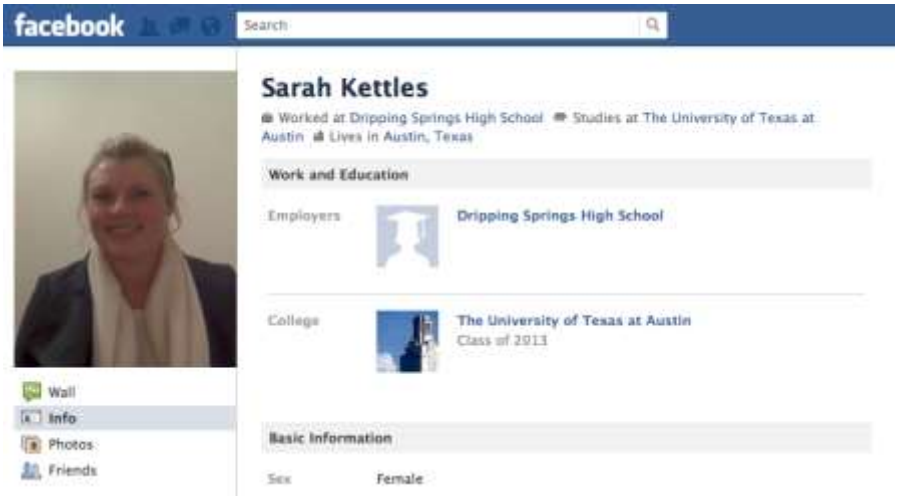
Evaluation Condition Manipulation

The evaluation channel manipulation was the same for both Study 1, Experiments 1 and 2 in Study 1. Participants were "evaluated" for a timed period of five minutes. Participants in the Facebook evaluation channel condition were prompted to become Facebook "friends" with four research assistants' (RAs') profiles. Figure 2 provides a screenshot of a profile used by the "evaluators" during the study. This profile was constructed for laboratory use and contained a standard set of information (name, birth date, high school, college, home town, current town, job, gender). Evaluator profiles included only one photograph, taken in the lab against a blank wall. During the evaluation period, participants in this condition were instructed to browse each evaluator's profile to "learn more" about them.

Participants in the face-to-face evaluation channel condition were led to a separate room where the four "evaluators" sat around one half of a square table. Participants sat facing the evaluators and were led through a scripted interview. To ensure participants in this condition received equivalent information about evaluators as did the participants in the Facebook condition, evaluators began the interview by sharing the information disclosed in their Facebook profile (see above). The scripted interview surveyed content areas included in a Facebook profile during the time of the research study (2011-2012). The face-to-face interview script is included in the appendix.

After the evaluation, all participants spent five additional minutes answering questions about evaluators before receiving feedback from the experimenter.

Figure 2. Evaluator Profile.



Feedback Valence Manipulation

All participants were randomly assigned acceptance or rejection feedback. Scripted feedback was delivered verbatim either face-to-face or through the Facebook messenger chat client. Table 5 presents scripts for acceptance and rejection feedback. In an attempt to increase reactivity to rejection feedback in Study 1, Experiment 2, we amended the script to increase participants' sense of rejection.

Feedback Delivery

The experimenter delivered assigned feedback verbatim to the participants in their assessment room after the two five-minute evaluation and post-evaluation periods. All participants in Study 1, Experiment 1 received feedback verbally (face-to-face).

Post-Manipulation Instruction Set

Instructions for pre- and post-manipulation measures asked participants to report their feelings in the moment. However, to further encourage participants to respond to post-manipulation measures with their current feelings (and not to report their earlier answers instead), we included an additional script immediately subsequent to the feedback script. The post-manipulation set was delivered in the same medium as the feedback. Table 6 describes the post-manipulation instruction set delivered to all participants.

Table 5: Scripts for acceptance and rejection feedback for Study 1, Experiments 1 and 2

Acceptance Feedback (Study 1, Experiments 1 and 2) Based on your (interview/Profile), it seems like you will be a great fit for the likeability study! We can go ahead and get started now.
Rejection Feedback (Study 1, Experiment 1) Based on your (interview/Profile), it doesn't look like you'll be too good of a fit for the likeability study, but we actually have another study on social functioning that you can participate in for credit.
Rejection Feedback (Study 1, Experiment 2) Okay. Based on your (interview/Profile), it doesn't look like you'll be too good of a fit for the likeability study. Just a second (pause). Okay, so we actually do have another study on social functioning that you can participate in for the same credit so this won't be a total waste of our time.

Table 6: Post-manipulation feedback script for Study 1, Experiments 1 and 2

We'll need you to fill out some more questionnaires. Some of them may be the same as before, but those earlier surveys were screening questionnaires and we can't actually use that information. Please try to fill out these surveys with what you're feeling and thinking right this second, okay?

Figure 3. Rejection feedback script delivered through Facebook messenger.

Debriefing

Immediately after completing post-manipulation measures, the experimenter entered the participant's assessment room and delivered a scripted debrief. The experimenter informed the participant of the true nature of the manipulation, described the participant's specific condition, and explained the purpose of the deception used in the study. The experimenter encouraged the participant to refrain from discussing the manipulation with other students to maintain the integrity of the manipulation. All debriefing was delivered face-to-face. All participants (n=271) consented to the use of their data and signed the debrief form.

After being debriefed, participants were asked to answer measures about their belief in the manipulation using a 5-point Likert scale (0=*I was sure that the screeners were* ***not*** *rating me on likability* to 4=*I fully believed that the screeners were rating me on likability*).

Study 1, Experiment 2

Procedures matched those in Study 1, Experiment 1 save that participants were also randomly assigned to one of two feedback channel conditions (face-to-face or Facebook Messenger). Participants were thus assigned to one of eight groups. The 2x2x2x2 experimental design included three completely crossed between-group fixed factors (evaluation channel, feedback valence, and feedback channel) and one within-subjects fixed factor (time).

Feedback Channel Manipulation

The experimenter delivered assigned feedback verbatim to the participants after the evaluation and post-evaluation periods. Participants in Study 1, Experiment 2 were randomly assigned to receive either face-to-face or Facebook-mediated feedback.

Participants in the Facebook feedback channel condition received feedback through the Facebook Messenger chat client. Because Facebook Messenger reveals when users type, the experimenter typed using short phrases to emulate the cadence of spontaneous communication. Figure 3 depicts Facebook-mediated feedback delivery. Participants in the face-to-face feedback channel condition received feedback verbally from the experimenters. Feedback was scripted and delivered verbatim regardless of condition.

ANALYTIC STRATEGY

Hierarchical random-intercepts linear mixed effects regression models (LMER) were used to compare the effects of face-to-face and Facebook-mediated feedback on affect and self-esteem change. LMER allows for comparison of change between groups while accounting for correlation between repeated measures.

We estimated regression coefficients using restricted maximum likelihood (REML). We used nonparametric bootstrapping procedures (n=10,000) to estimate confidence intervals and permutation tests (n=10,000) to estimate *p* values for LMER models when model residuals were not normally distributed (Shapiro-Wilk *p*s < .100), as

was the case for all outcome variables in Study 1, Experiment 1 and state negative affect and state self-esteem in Study 1, Experiment 2[1]. When residuals were normally distributed, as was the case for state positive affect in Study 1, Experiment 2, we used the likelihood-ratio test to estimate p_{LRT} values. Similarly, for follow-up t-tests we used nonparametric bootstrapping procedures (n=10,000) to estimate confidence intervals, and parametric tests (n=10,000) *p* values and confidence intervals when the data were not normally distributed.

Standardized regression coefficients (β) were included to provide an estimate of effect size. Binary variables were dummy coded (e.g., 0=*Facebook feedback*, 1=*face-to-face feedback*) and all predictors grand mean centered. Variables expected to influence emotional reactivity (i.e., initial scores on outcome variables, fear of negative evaluation, participants' ratings of their evaluators, gender, and age) were tested as intercept-level covariates during model selection for all LMER models.

To interpret interactions between the experimental factors, we followed the procedure recommended by Aiken and West (1991), which computes the model-based predicted effect of one experimental factor at different levels of the other. For three-way interactions, we compared the model-based predicted slopes for two experimental factors at different levels of the third. This approach has the advantage of using all the data from all participants to calculate the effect of the intervention, as opposed to examining the intervention effects separately within different subsamples.

We reported ps < .100 and considered *p*s < .050 statistically significant. Follow-up t-tests of predicted values are two-sided.

Model Selection

We used the corrected Akaike's information criterion (AICc) to identify which random effects (intercepts, slopes, correlated intercepts and slopes) and covariates (age,

[1] We chose not to transform the variable as transformations have been found to decrease estimates of true moderator effects (Russell & Dean, 2000).

gender, fear of negative evaluation, ratings of evaluators) to include in our hypothesized model.

For each experiment we compared models with different combinations of covariates – one model with no covariates, four models each including one covariate (e.g., age only), and one model including all four covariates. After the best combination of covariates was selected, we compared three models allowing estimation of different random effects – random intercepts only (random intercepts for each subject), random intercepts and random slopes (i.e., random intercepts and random slopes for each subject), and correlated random intercepts and slopes.

Table 7: Distribution of participant belief in the manipulation for Study 1, Experiments 1 and 2

	Facebook Evaluation		Face-to-face Evaluation	
	Acceptance	Rejection	Acceptance	Rejection
Believed	27	14	18	15
Suspicious	7	1	3	4

Table 8: Number of participants who believed in the manipulation by experimental condition for Study 1, Experiment 1

	0	1	2	3	4
	Did not believe				Fully believed
Study 1, Experiment 1	2 (2.35%)	9 (10.59%)	19 (22.35%)	27 (31.76%)	28 (32.94%)
Study 1, Experiment 2	8 (4.55%)	16 (9.09%)	34 (19.32%)	51 (28.98%)	67 (38.07%)

RESULTS

Study 1, Experiment 1

Manipulation Check

Participants who endorsed 0 (*I was sure the screeners were **not** rating me on likability*) or 1 (*I had strong doubts [they were]*) on the post-debrief manipulation check (*n*=15,16.8%) were considered suspicious and were excluded. As expected, inclusion of suspicious participants reduced the manipulation's effects. Suspicious participants did not appreciably differ from the remaining sample on pre-manipulation variables (*p*s>.10) and group assignment had no appreciable effect on suspicion, $\chi^2(3)=2.15$, $p>.100$. The final sample size was $n=74$.

Table 7 presents the distribution of participant belief in the manipulation by group for both experiments. In Study 1, Experiment 1, group assignment had no appreciable effect on suspicion, $\chi^2(3)=1.50$,$p>.100$. Table 8 presents the distribution of participant belief for Study 1, Experiment 1.

Descriptive Statistics

Tables 9 and 10 present demographics and descriptive statistics for outcome variables – state positive affect (PA), state negative affect (NA), and state self-esteem (SE) – and covariates – age, gender, fear of negative evaluation (FNE) and participants' ratings of their evaluators – for each group in Study 1, Experiment 1. There were no appreciable between-group differences on baseline measures of emotional reactivity (*p*s>.100). People randomly assigned to be evaluated online gave less positive ratings to their evaluators, possibly because they spent less time interacting with them ($p<.050$). We included all baseline variables and covariates as intercept-level variables in model selection. Zero-order correlation tables are presented in Table 11.

Table 9: Study 1, Experiment 1 Adjusted Means and Standard Deviations for Measures of State Positive Affect (PA), State Negative Affect (NA) and State Self-Esteem (SE) by Condition

	Facebook Evaluation (N=44)				Face-to-Face Evaluation (N=33)			
	Acceptance (N=30)		Rejection (N=14)		Acceptance (N=18)		Rejection (N=15)	
	21 female, Age=19.19 (1.14)		*13 female, Age=19.00 (1.11)*		*9 female, Age=19.33 (1.33)*		*10 female, Age=18.80 (1.01)*	
	Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
PA								
Mean	21.80	22.49	21.14	17.71	19.83	23.41	24.54	20.93
SD	*9.06*	*9.06*	*5.08*	*5.08*	*5.62*	*5.62*	*5.45*	*5.45*
NA								
Mean	4.46	2.19	2.26	2.02	5.18	2.92	2.97	1.82
SD	*3.80*	*3.80*	*2.30*	*2.30*	*5.66*	*5.66*	*2.22*	*2.22*
SE[#]								
Mean	55.44	56.97	58.82	60.73	48.58	53.10	57.28	58.44
SD	*14.73*	*14.59*	*14.60*	*13.46*	*13.43*	*12.97*	*14.47*	*13.82*

PA: State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); NA: State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); SE: State Self-Esteem measured by the State Self-Esteem Survey (SES; Heatherton & Polivy, 1994)

[#] Due to experimenter error, 21 post-manipulation data points on state self-esteem are missing from Study 1, Experiment 1

Table 10: Study 1, Experiment 1 Adjusted Means and Standard Deviations for Measures of Fear of Negative Evaluation (FNE), Participants' Ratings of Evaluators, and Participant's Ratings of Belief in the Experimental Manipulation

	Facebook Evaluation (N=44)		Face-to-Face Evaluation (N=33)	
	Acceptance (N=30)	Rejection (N=14)	Acceptance (N=18)	Rejection (N=15)
FNE	23.44 *(14.07)*	20.93 *(12.85)*	32.00 *(10.85)*	24.47 *(13.20)*
Eval. Ratings	29.12 *(6.09)*	29.93 *(4.03)*	35.59 *(7.62)*	33.60 *(5.19)*
Manip. Check	1.89 *(0.80)*	2.21 *(0.80)*	1.72 *(0.75)*	1.73 *(0.80)*

FNE: Fear of Negative Evaluation
Eval. Ratings: Participants' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability
Manip. Check: Participants' ratings of credibility of manipulation

Table 11: Zero-order Correlations Between Covariates and Post-Manipulation Reactivity Measures for Study 1, Experiment 1

	PANAS PA	PANAS NA	SSE	Age	Gender	FNE	Eval. Ratings	Belief in Manipulation
PANAS PA	--	0.00	0.25[d]	-0.24[d]	-0.01	-0.06	0.24[d]	-0.06
PANAS NA	--	--	-0.49[a]	-0.18	-0.08	0.41[a]	-0.08	0.03
SSE^	--	--	--	0.06	0.09	-0.69[a]	0.04	0.17
Age	--	--	--	--	-0.05	-0.03	0.20[e]	0.10
FNE	--	--	--	--	--	-0.16	0.03	0.13
Gender	--	--	--	--	--	--	0.12	-0.18
Eval. Ratings	--	--	--	--	--	--	--	-0.08

PANAS PA: Post-manipulation State Positive Affect; PANAS NA: Post-manipulation State Negative Affect
SSE: Post-manipulation State Self-Esteem
FNE: Fear of Negative Evaluation
Eval. Ratings: Participants' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability
^ Due to experimenter error, 21 post-manipulation data points on self-esteem from Study 1, Experiment 1 were missing.
[a] *p </= .001* [b] *p </= .005* [c] *p </= .025* [d] *p </= .050* [e] *p </= .100*

Table 12: Study 1, Experiment 1 Unstandardized and Standardized Regression Coefficients for Effects of Experimental Variables and Covariates

	Response Variables																	
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE) #					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
Pre-Ratings	0.93	0.84	1.02	0.86	0.81	0.89	0.80	0.72	0.87	0.86	0.81	0.88	0.94	0.89	1.00	0.95	0.93	0.96
Eval. Ratings	0.02	-0.09	0.12	0.01	-0.07	0.10	-0.01	-0.07	0.04	-0.02	-0.10	0.06	0.05	-0.08	0.17	0.02	-0.04	0.08
Gender	1.83	0.38	3.29	0.10	0.02	0.18	--	--	--	--	--	--	1.76	-0.13	3.66	0.05	0.00	0.11
Belief in Feedback	-0.19	-1.01	0.66	-0.02	-0.10	0.06	0.30	-0.15	0.75	0.05	-0.03	0.13	0.25	-0.88	1.36	0.01	-0.04	0.07
Time	-0.26	-1.44	0.90	-0.02	-0.09	0.06	-1.61	-2.32	-0.90	-0.18	-0.26	-0.10	3.24	1.65	4.87	0.11	0.05	0.16
Eval. Med.	1.63	-0.71	3.91	0.05	-0.02	0.12	-0.36	-1.78	1.08	-0.02	-0.10	0.06	2.88	-0.37	6.09	0.05	-0.01	0.10
Feed. Val.	-5.51	-7.85	-3.05	-0.17	-0.24	-0.10	1.61	0.18	3.03	0.09	0.01	0.17	-4.42	-7.71	-1.02	-0.07	-0.13	-0.02
Eval. Med. * Feed. Val	-3.06	-7.78	1.58	-0.05	-0.12	0.02	-0.92	-3.77	1.91	-0.03	-0.10	0.05	-4.71	-11.53	1.76	-0.04	-0.09	0.01

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), beta=standardized regression coefficients; Eval. Med.=Evaluation channel; Feed. Val.=Feedback Valence; Comm. Ch.=Communication channel; FNE=Fear of Negative Evaluation as measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983); Eval. Ratings=Participants' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994), # Due to experimenter error, 21 post-manipulation data points on state self-esteem are missing from Study 1, Experiment 1

[a]p≤.001 [b]p≤.005 [c]p≤.025 [d]p≤.050 [e]p≤.100

Missing Data

Due to experimenter error, the first 21 subjects in Study 1, Experiment 1 are missing data points for post-manipulation state self-esteem. Because the events resulting in the missing data were completely independent of any variables of interest in the study, the missing data is considered missing completely at random. As LMER models are robust against missing data, we included the cases with missing data in our analyses. Participants with missing data appeared evenly distributed between groups, $\chi^2(3)=2.55$, $p>.10$, and did not appreciably differ from the remaining sample on baseline variables (ps>.10). Table 13 presents the distribution of missing data points by experimental group.

Table 13: Data Missing Completely at Random in Study 1, Experiment 1 by Experimental Condition

Facebook Evaluation		Face-to-face Evaluation	
Acceptance	Rejection	Acceptance	Rejection
(*n*=6, 22.22%)	(*n*=6, 42.86%)	(*n*=4, 22.22%)	(*n*=5, 33.33%)

The effect of feedback valence and evaluation channel on state positive affect, state negative affect, and state self-esteem change.

Figure 4 presents standardized mean change, or effect size of change (d),s in *state positive affect* (PA), *state negative affect* (NA), and *state* s*elf-esteem* (SE) for the four groups in Study 1, Experiment 1. Table 12 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized model for each of the three outcome variables.

As expected, feedback prompted change in all outcome variables (ps<.050, 0.03>|βs|>0.17). Acceptance increased both PA, b=1.79 [0.40, 3.20], t(41)=2.47, p<.050, d=0.54 [0.10, 0.98], and SE, b=5.00 [2.37, 7.86], t(32)=13.19, p<.001, d=0.87 [0.35, 1.38], and decreased NA, b=-2.24 [-3.51, -1.21], t(41)=-3.85, p<.001, d=-0.84 [-1.29, -0.39]. Rejection decreased PA, b=-3.62 [-5.67, -1.69], t(28)=-3.57, p<.005, d=-0.94 [-1.49, -0.38], but prompted no appreciable SE or NA change (ps>.100).

There was evidence that evaluation prompted change in SE (β=0.05), but the effect was not statistically significant (p<.100). Evaluation condition prompted no appreciable change in PA or NA (ps>.100), and there was no appreciable evidence supporting the hypothesized interaction between evaluation condition and feedback condition (ps>.10). Examination of Figure 4 suggests the non-significant effect of evaluation feedback on SE, if it exists, could have been explained by an increase in self-esteem after face-to-face acceptance feedback. However, our study was insufficiently powered to detect such an effect.

In summary, participants who received acceptance feedback reported increases in PA and SE and decreases in NA, and those who received rejection feedback reported decreases in PA. There was little evidence that participants responded differently to feedback via their Facebook Profile than they did to feedback delivered via a face-to-face interview, although a non-significant trend suggests participants who received feedback about a face-to-face evaluation may have reported an overall increase in SE, as indicated

in Figure 4. Figure 4 further suggests that acceptance feedback may have increased SE only for participants evaluated via face-to-face interview, which would suggest that our sample of participants with SE data (n=53) was inadequate to detect this interaction effect, if it exists.

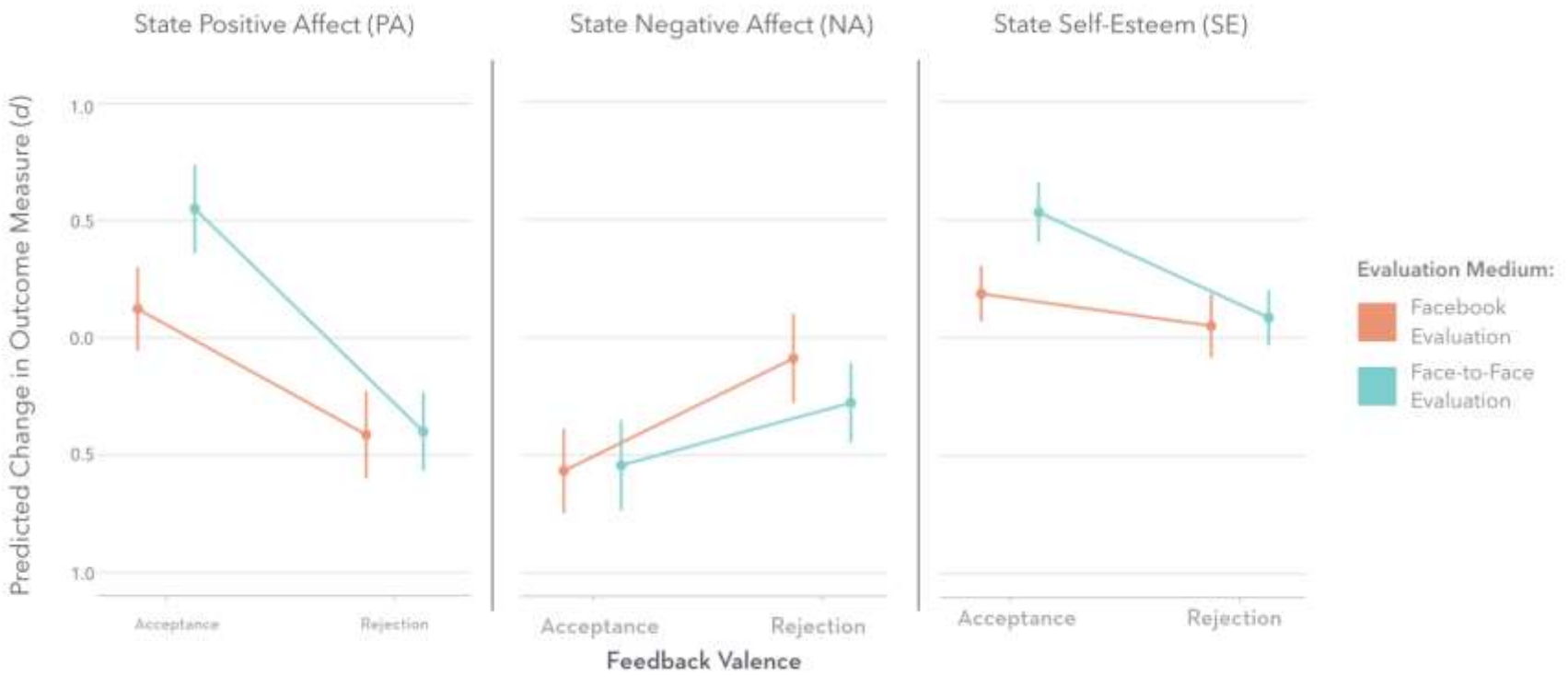


Figure 4: Results from Study 1, Experiment 1

Predicted standardized mean change, or effect size (d), in state positive affect (PA), state negative affect (NA), and state self-esteem (SE) for participants receiving acceptance and rejection feedback as a function of evaluation channel. Error bars represent 95% confidence intervals. Analysis shows significant main effect of feedback valence for all three outcome variables: acceptance feedback increased PA and SE, and decreased NA; rejection feedback decreased PA (*p*s<.050). There was no appreciable effect of evaluation channel on any of the outcome variables, nor did we detect the hypothesized interaction between the two experimental factors (*p*s>.050).

Study 1, Experiment 2

Manipulation Check

Participants who endorsed 0 (*I was sure the screeners were* ***not*** *rating me on likability*) or 1 (*I had strong doubts [they were]*) on the post-debrief manipulation check (*n*=30,16.5%) were considered suspicious and were excluded. As expected, inclusion of suspicious participants reduced the manipulation's effects. The final sample size was *n*=152.

Table 7 presents the distribution of participant belief in the manipulation by group for both experiments, and Table 14 presents the distribution of participants' belief in the manipulation for Study 1, Experiment 2. Group assignment appeared to have an effect on suspicion, $\chi^2(7)=14.62$, $p<.050$. Among participants evaluated face-to-face who then received face-to-face feedback, the odds of reporting suspicion after rejection were 11.14 times higher than they were for participants who were accepted. In comparison, among participants evaluated on Facebook who then received face-to-face feedback, the odds of reporting suspicion after rejection were only 0.24 times higher than they were after acceptance. Figure 5 presents a mosaic plot depicting the effect of condition on suspicion as measured by the manipulation check item.

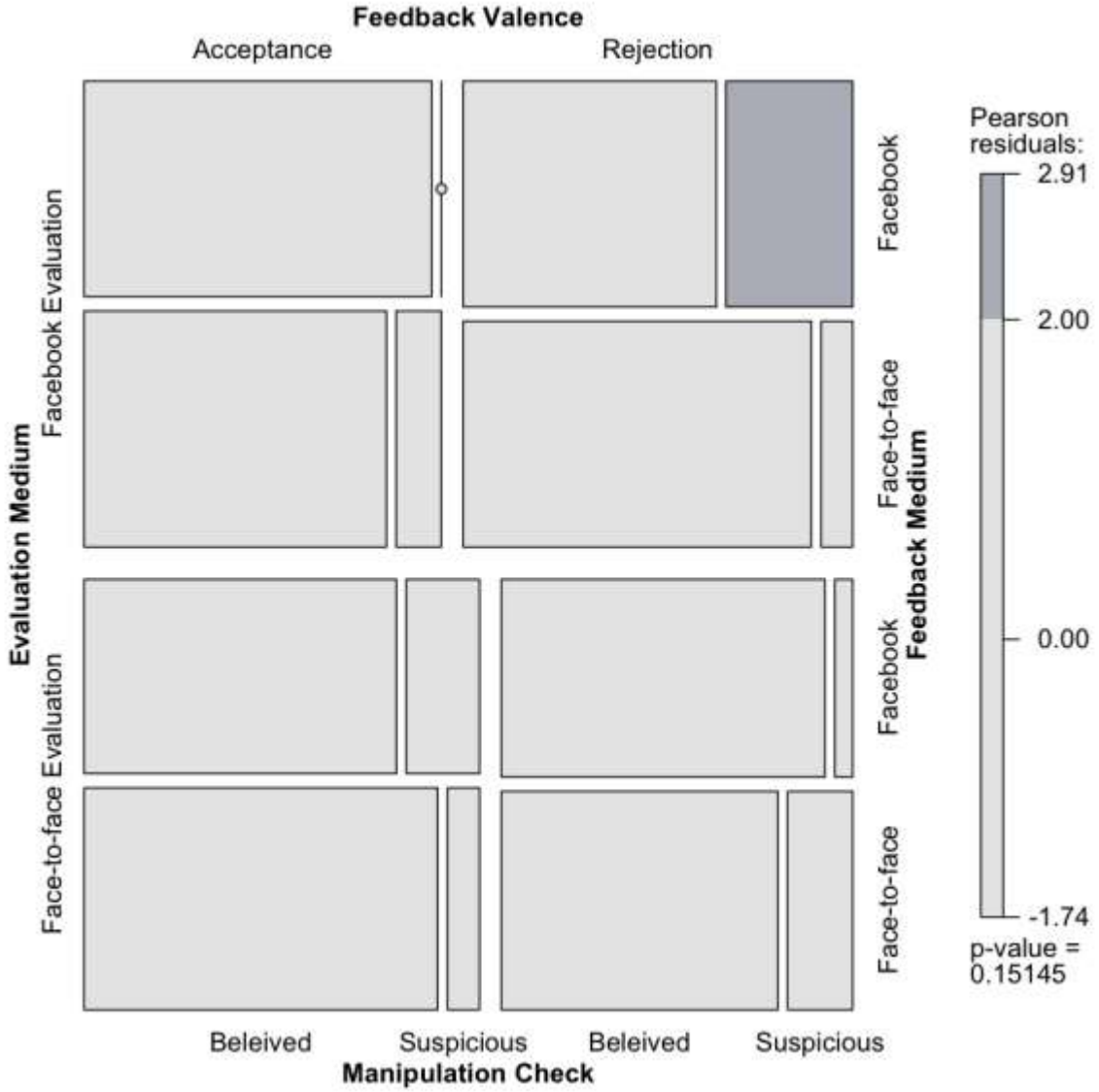
The analyses suggest that participants assigned to receive face-to-face rejection feedback based on a face-to-face evaluation were more likely to report suspicion than the other groups. Because face-to-face rejection feedback after Facebook-mediated evaluation did not prompt a similar level of suspicion, our findings do not appear to suggest that the feedback delivery was flawed. Further, because face-to-face acceptance after face-to-face feedback did not similarly prompt greater rejection, our findings do not suggest that face-to-face exposure to the manipulation increased suspicion in participants. The condition prompting the most suspicion, face-to-face rejection feedback following face-to-face evaluation, was hypothesized to be the most distressing of all the conditions. It is possible

that the strong negative emotions elicited by this condition prompted participants to review the study more carefully than did their peers in other conditions.

Table 14: Participant Belief in the Manipulation by Experimental Condition for Study 1, Experiment 2

	Facebook Evaluation				Face-to-face Evaluation			
	Facebook Feedback		Face-to-face Feedback		Facebook Feedback		Face-to-face Feedback	
	Acceptance	Rejection	Acceptance	Rejection	Acceptance	Rejection	Acceptance	Rejection
Believed	22	17	17	18	20	22	20	16
Suspicious	4	4	6	1	4	2	1	8

Figure 5: The effect of experimental condition on suspicion as measured by the manipulation check item. Colored blocks represent large deviations from the residual mean.



Descriptive Statistics

Tables 15 and 16 present demographics and descriptive statistics for outcome variables – state positive affect (PA), state negative affect (NA), and state self-esteem (SE) – and covariates – age, gender, fear of negative evaluation (FNE) and participants' ratings of their evaluators – for each group in Study 1, Experiment 2. There were no appreciable between-group differences for outcome variables or covariates (*p*s>.10). Zero-order correlation tables are presented in Table 17.

Table 15: Study 1, Experiment 2 Adjusted Means and Standard Deviations for Measures of State Positive Affect (PA), State Negative Affect (NA) and State Self-Esteem (SE) by Condition

		Facebook Evaluation (N=74)								Face-to-face Evaluation (N=79)							
		Acceptance (N=39)				Rejection (N=35)				Acceptance (N=41)				Rejection (N=38)			
		Facebook Feedback (N=22)		Face-to-face Feedback (N=17)		Facebook Feedback (N=17)		Face-to-face Feedback (N=18)		Facebook Feedback (N=20)		Face-to-face Feedback (N=20)		Facebook Feedback (N=22)		Face-to-face Feedback (N=16)	
		7 female, Age=18.59 (0.80)		*7 female, Age=18.65 (0.70)*		*9 female, Age=18.59 (0.94)*		*12 female, Age=18.39 (0.70)*		*14 female, Age=18.80 (0.70)*		*12 female, Age=18.47 (0.70)*		*10 female, Age=18.82 (0.96)*		*9 female, Age=18.81 (1.05)*	
		Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
PA																	
	Mean	15.66	15.15	18.01	17.36	14.85	11.58	16.58	13.11	13.73	13.30	15.69	14.71	14.27	12.23	15.05	12.44
	SD	*7.73*	*7.73*	*7.29*	*7.29*	*7.76*	*7.76*	*8.53*	*8.53*	*6.89*	*6.89*	*8.92*	*8.92*	*7.73*	*7.73*	*9.39*	*9.39*
NA																	
	Mean	3.38	2.52	2.96	2.19	1.81	1.24	1.28	1.54	2.43	1.87	2.58	2.08	2.86	2.76	1.13	2.41
	SD	*3.93*	*3.93*	*4.17*	*4.17*	*2.32*	*2.32*	*1.89*	*1.89*	*2.26*	*2.26*	*2.26*	*2.26*	*3.74*	*3.74*	*1.71*	*1.71*
SE																	
	Mean	50.69	52.37	57.44	57.88	59.12	57.35	57.16	55.33	56.26	56.84	50.18	52.58	56.98	56.04	55.48	52.03
	SD	*15.55*	*15.86*	*13.49*	*13.81*	*11.89*	*11.89*	*14.47*	*14.47*	*14.40*	*14.40*	*14.18*	*14.18*	*16.06*	*16.06*	*11.95*	*11.95*

PA: State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988)
NA: State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); SE: State Self-Esteem measured by the State Self-Esteem Survey (SES; Heatherton & Polivy, 1994)

Table 16: Study 1, Experiment 2 Adjusted Means and Standard Deviations for Measures of Fear of Negative Evaluation (FNE) and Participants' Ratings of Evaluators (Eval. Rating)

	Facebook Evaluation (N=74)				Face-to-Face Evaluation (N=78)			
	Acceptance (N=39)		Rejection (N=35)		Acceptance (N=40)		Rejection (N=38)	
	Facebook Feedback (N=22)	Face-to-Face Feedback (N=17)	Facebook Feedback (N=17)	Face-to-Face Feedback (N=18)	Facebook Feedback (N=20)	Face-to-Face Feedback (N=20)	Facebook Feedback (N=22)	Face-to-Face Feedback (N=16)
FNE	23.36 (*13.24*)	18.82 (*10.63*)	23.65 (*11.19*)	19.72 (*12.82*)	23.75 (*13.33*)	23.75 (*11.48*)	22.32 (*12.49*)	22.31 (*12.45*)
Eval. Rating	27.82 (*4.67*)	27.29 (*6.67*)	26.88 (*7.28*)	28.83 (*5.06*)	29.75 (*6.08*)	28.4 (*5.75*)	28.23 (*4.59*)	28.25 (*5.62*)
Manip. Check	1.55 (*0.80*)	2 (*0.79*)	1.65 (*0.79*)	1.78 (*0.88*)	1.75 (*0.79*)	1.80 (*0.83*)	1.95 (*0.90*)	1.81 (*0.66*)

FNE=Fear of Negative Evaluation measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983)
Eval. Rating=Participants' rating of evaluators measured by three items assessing likability, attractiveness, & relatability
Manip. Check: Participants' ratings of credibility of manipulation

Table 17: Zero-order Correlations Between Covariates and Post-Manipulation Reactivity Measures for Study 1, Experiment 2

	PANAS PA	PANAS NA	SSE	Age	Gender	FNE	Eval. Ratings	Belief in Feedback
PANAS PA	--	-0.11	0.25[d]	-0.07	0.02	-0.18[c]	0.06	0.10
PANAS NA	--	--	-0.53[e]	0.12	0.03	0.37[a]	0.03	-0.05
SSE	--	--	--	-0.05	-0.12	-0.74[a]	0.06	0.05
Age	--	--	--	--	-0.09	0.09	-0.06[e]	0.04
FNE	--	--	--	--	--	0.05	-0.02	-0.08
Gender	--	--	--	--	--	--	-0.05	-0.14
Eval. Ratings	--	--	--	--	--	--	--	0.02

PANAS PA: Post-manipulation State Positive Affect
PANAS NA: Post-manipulation State Negative Affect
SSE: Post-manipulation State Self-Esteem
FNE: Fear of Negative Evaluation
Eval. Ratings: Participants' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability
[a] *p </= .001* [b] *p </= .005* [c] *p </= .025* [d] *p </= .050* [e] *p </= .100*

Table 18: Study 1, Experiment 2 Unstandardized and Standardized Regression Coefficients for Effects of Experimental Variables and Covariates

	Response Variables																	
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE)					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
Pre-Ratings	0.96	0.92	1.01	0.92	0.91	0.93	0.88	0.82	0.93	0.87	0.84	0.89	0.96	0.92	1.00	0.93	0.90	0.96
Eval. Ratings	-	-	-	-	-	-	-0.01	-0.04	0.03	-0.01	-0.07	0.04	-0.09	-0.16	-0.02	-0.03	-0.06	-0.01
Gender	0.83	0.07	1.58	0.05	0.00	0.09	-	-	-	-	-	-	-	-	-	-	-	-
Age	0.06	-0.38	0.52	0.01	-0.04	0.05	0.15	-0.10	0.38	0.04	-0.02	0.09	-0.12	-0.61	0.36	-0.01	-0.03	0.02
Belief in Feedback	-0.30	-0.78	0.17	-0.03	-0.07	0.02	-0.01	-0.25	0.23	0.00	-0.06	0.05	-0.02	-0.53	0.48	0.00	-0.03	0.03
FNE	-	-	-	-	-	-	-	-	-	-	-	-	-0.06	-0.11	-0.01	-0.05	-0.10	-0.01
Time	-1.71	-2.44	-0.97	-0.10	-0.14	-0.06	-0.24	-0.62	0.14	-0.04	-0.09	0.02	-0.33	-1.12	0.45	-0.01	-0.04	0.02
Eval. Med.	0.47	-1.00	1.99	0.01	-0.03	0.06	0.51	-0.25	1.28	0.04	-0.02	0.09	0.00	-1.57	1.58	0.00	-0.03	0.03
Feed. Val.	-2.18	-3.62	-0.69	-0.06	-0.11	-0.02	0.87	0.11	1.63	0.06	0.01	0.12	-3.24	-4.85	-1.69	-0.06	-0.08	-0.03
Comm. Ch.	-0.37	-1.86	1.13	-0.01	-0.05	0.03	0.59	-0.16	1.36	0.04	-0.01	0.10	-0.27	-1.83	1.32	0.00	-0.03	0.02
Eval. Med. * Feed. Val	1.17	-1.87	4.16	0.02	-0.03	0.06	0.44	-1.08	1.98	0.02	-0.04	0.07	-0.63	-3.77	2.57	-0.01	-0.03	0.02
Eval. Med. * Feed. Med	-0.39	-3.43	2.58	-0.01	-0.05	0.04	0.25	-1.27	1.81	0.01	-0.05	0.07	-0.14	-3.34	3.00	0.00	-0.03	0.03
Feed. Val * Comm. Ch.	-0.05	-2.99	2.90	0.00	-0.04	0.04	1.03	-0.50	2.56	0.04	-0.02	0.09	-2.14	-5.33	1.02	-0.02	-0.05	0.01

Eval. Med. * Feed. Val. * Comm. Ch.	0.03	-5.92	6.07	0.00	-0.04	0.04	0.60	-2.45	3.67	0.01	-0.04	0.07	-4.60	-10.94	1.73	-0.02	-0.05	0.01

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), Beta=standardized regression coefficients; Eval. Med.=Evaluation channel; Feed. Val.=Feedback Valence; Comm. Ch.=Communication channel; FNE=Fear of Negative Evaluation as measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983); Eval. Ratings=Participants'' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

The effect of evaluation channel, feedback valence, and feedback channel on state positive affect, state negative affect, and state self-esteem change.

Figure 6 presents standardized mean change, or effect size of change (d), in *state positive affect* (PA), *state negative affect* (NA), and *state self-esteem* (SE) for the eight groups in Study 1, Experiment 2. Table 18 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized model for each of the three outcome variables.

Similar to the results in Study 1, Experiment 1, feedback delivered through Facebook prompted emotional reactivity for all outcomes (ps<.05). Acceptance increased SE, b=1.58 [0.61, 2.58], t(70)=3.19, p<.005, d=0.54 [0.20, 0.87], and decreased NA, b=-0.68 [-1.76, -0.21], t(70)=-3.85, p<.001, d=-0.93 [-0.78, -0.11], but prompted no appreciable PA change (p>.100). Rejection decreased PA, b=-2.70 [-3.67, -1.76], t(70)=-5.56, p<.001, d=-0.94 [-1.28, -0.58], and SE, b=-1.97 [-3.27, -0.72], t(70)=-3.02, p<.005, d=-0.51 [-0.84, -0.17], but prompted no appreciable NA change (p>.100). There was no appreciable main effect of evaluation channel or feedback channel on any of the outcome variables *(ps*>.10). None of the hypothesized interactions between evaluation channel, feedback valence, and feedback channel were significant *(ps*>.10).

In summary, participants who received acceptance feedback reported increases in SE and decreases in NA, and those who received rejection feedback reported decreases in PA and SE. Our experiment may have been underpowered to detect interaction effects driving these findings. For example, examination of Figure 6 suggests face-to-face feedback may explain the large increase in NA following rejection, although our experiment was underpowered to detect such an effect. Similarly, Figure 6 suggests that face-to-face feedback may explain the moderate decrease in SE following rejection. Future research with larger samples would be necessary to determine whether there is a substantive difference between Facebook-mediated and face-to-face feedback.

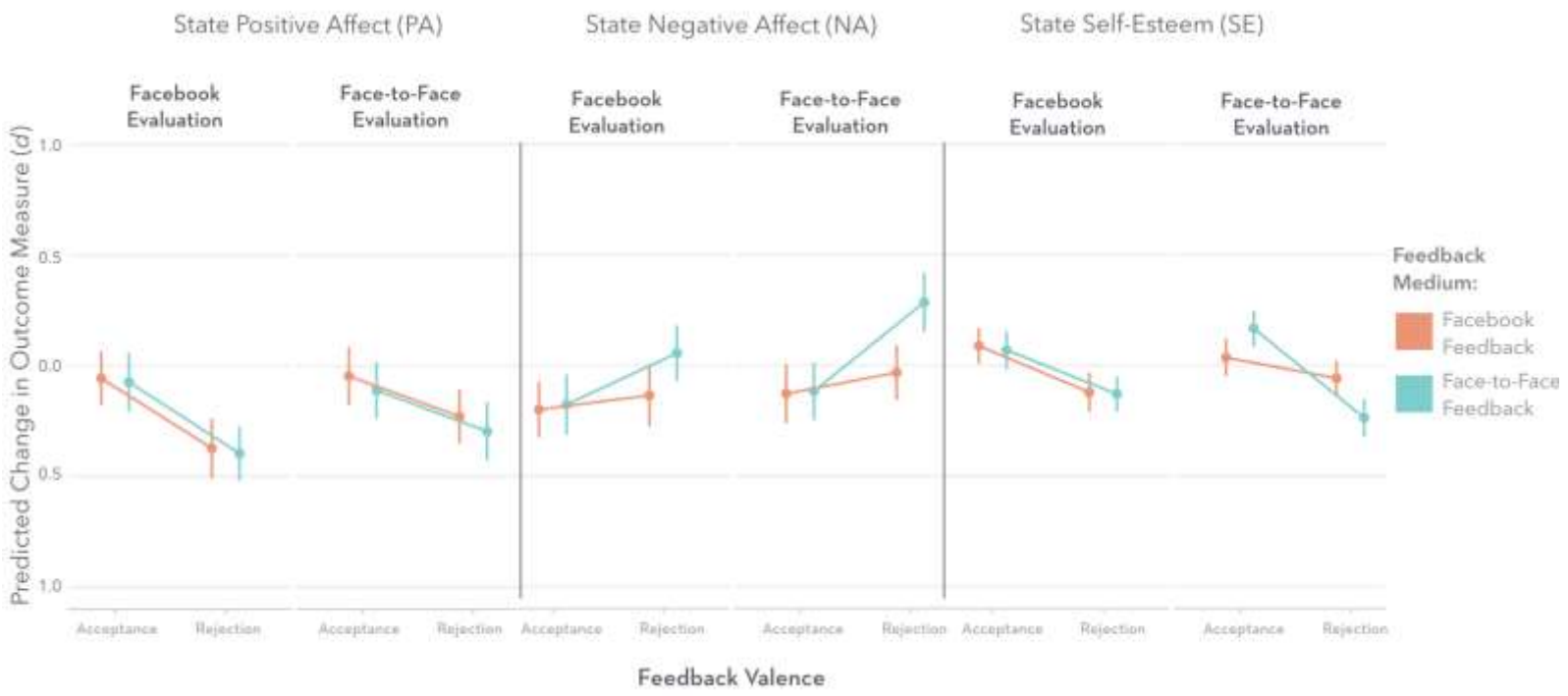


Figure 6: Results from Study 1, Experiment 2.

Predicted standardized mean change (*d*) in state positive affect (PA), state negative affect (NA), and state self-esteem (SE) for participants receiving acceptance and rejection feedback as a function of evaluation channel and feedback channel. Error bars represent 95% confidence intervals. Analysis shows significant main effect of feedback valence for all three outcomes: acceptance increased SE and decreased NA; rejection decreased PA and SE (*p*s<.050). There was no appreciable effect of either evaluation channel or feedback channel on any of the outcome variables, nor did we detect the hypothesized three-way interaction between the experimental factors (*p*s>.050).

DISCUSSION

We investigated whether communication medium affects emotional reactivity by comparing reactivity to feedback about Facebook-mediated and face-to-face self-presentation. In two samples of undergraduates who believed they were evaluated for research on "extremely likable and charismatic" students, our experimental manipulation changed affect and self-esteem, but Facebook-mediated evaluation or feedback did appreciably differ from face-to-face evaluation or feedback.

In both experiments, there were non-significant trends suggesting that reactivity to feedback happened primarily for participants in face-to-face conditions, although our experiments were insufficiently powered to detect whether this was the case. In Study 1, Experiment 1, there was evidence that the effect of acceptance on self-esteem may be explained by the large increase in state self-esteem following acceptance feedback delivered via a face-to-face interview. In Study 1, Experiment 2, there was evidence that rejection's effect on negative affect may have been explained by the large increase in negative affect following face-to-face rejection feedback. Similarly, there was evidence that rejection's effect on self-esteem was explained by a moderate decrease in self-esteem following face-to-face rejection feedback. However, we cannot conclude that evaluation channel or feedback channel has any effect on affect or self-esteem based on the results of this study.

There are many reasons to continue investigating whether and under what circumstances Facebook may alter reactivity to feedback. Facebook affords more control over self-presentation than face-to-face communication, which led us to predict that Facebook-mediated evaluation and feedback would reduce reactivity in our sample. Perceived control over negative outcomes may reduce emotional reactivity (Sanderson, Rapee & Barlow; 1989; Telch et al., 1994), and attribution theory (Weiner, 1974) suggests individuals' causal attributions influence their reactions. Although Facebook Profiles may

accurately reflect personality (Back et al., 2010), it is possible people view Profile feedback not as remarks on their overall likability, but rather on their ability to present likably on Facebook. Additionally, self-theory (Dweck & Leggett, 1988) suggests increased perceived control reduces the threat of rejection. People given negative feedback about their Facebook Profile could potentially be comforted by the belief that they could avoid future rejection by changing their Profile.

Our research contributes to the growing body of literature on the effects of Facebook use on self-esteem. Because Facebook users can deliberately present flattering personal content (Walther, Slovacek, & Tidwell, 2001), they may believe their Facebook Profile represents an "idealized" version of their identity (Walther, Slovacek, & Tidwell, 2001; Gonzales & Hancock, 2011). Consequently, researchers have hypothesized Facebook is self-affirming for users (Toma & Hancock, 2013), who get a self-esteem boost from viewing their own Facebook Profile (Toma, 2014; Gonzales & Hancock, 2011). Although we did not explicitly investigate the effects of Profile views on reactivity to feedback in our sample, we did not notice any increase in self-esteem for participants evaluated or given feedback on Facebook.

Do social interactions on Facebook affect us differently than face-to-face interactions do? The results from Study 1 are inconclusive. The data suggests that face-to-face and Facebook-mediated evaluation and feedback have similar effects on emotional reactivity, although face-to-face interactions may have a stronger effect on negative affect and self-esteem. Future research studies with larger samples would be needed to identify any such effects.

Study 2: Private Cyberbullying Feedback More Damaging Than Public Cyberbullying Feedback

Bullying in front of an audience – for instance, bullying on a Facebook Profile – is perceived as being worse than bullying without an audience (Slonje & Smith, 2008; Nocentini et al., 2010). Because people react more strongly to public feedback than they do to private feedback (Leary, Cottrell, & Phillips, 2001), bullying on users' Facebook Profiles, which is often visible to users' social networks, could prompt more emotional reactivity than other, less-public forms of bullying, such as feedback shared through Facebook's private messaging platform. In this study, we compared the effects of public and private Facebook-mediated bullying feedback on emotional reactivity. We measured state positive and negative affect and state self-esteem before and after the delivery of controlled manipulations of two factors: feedback valence and feedback channel. We also measured sociometric status rankings of the participant and the feedback provider before and after the manipulation.

Specific Aims and Hypotheses

To understand how bullying feedback delivered via private and public channels on Facebook affects emotional reactivity, we compared emotional reactivity to supportive or bullying feedback (feedback valence) delivered on Facebook through either a private or a public channel (communication medium). We expected participants would react negatively to cyberbullying feedback and positively to supportive feedback. Because people react more strongly to public feedback than they do to private feedback (Leary, Cottrell, & Phillips, 2001), we expected this reactivity would be more pronounced when feedback was posted on participants' Facebook Profile than when it was delivered through Facebook's private messaging channel.

We also asked participants to provide personal and expected peer rankings of themselves, and expected peer rankings of the bullying confederate, to understand how feedback delivery via private and public channels on Facebook affects perceptions of social

status. We expected that participants' rankings of the confederate, their expected peer rankings of themselves, and their expected peer rankings of the confederate would decrease after public bullying feedback, but that only participants' rankings of the confederate and their expected group rankings of themselves would decrease after private bullying feedback.

METHODS

The research design for this study was reviewed and approved by The University of Texas at Austin (UT) Institutional Review Board (IRB) (protocol #2011-10-0035).

Sample Recruitment

Participants between the ages of 18 and 24 were recruited from The University of Texas' introductory Psychology subject pool and participated for course credit. Random assignment to one of the four treatment groups was done using a random number generator. Table 19 presents the recruitment criteria approved by the IRB.

Because our experimental manipulation was hypothesized to prompt short-term distress, individuals were excluded for their protection if they reported clinical symptoms of suicidality. All participants completed a computer-adapted version of the Suicidality module of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997) during the in-lab screening survey. Individuals excluded for this reason were provided immediate face-to-face support by trained clinicians through the Clinical Psychology area of the UT Psychology Department. Participants in reporting suicidal ideation (n=3) were excluded from participation.

Because we expected baseline emotional state to affect response, assignment to groups was stratified on baseline state positive affect, as measured by the Positive and Negative Affect Schedule-X (Watson, Clark, & Telegen, 1988) and baseline state self-esteem, as measured by the State Self-Esteem Scale (Heatherton & Polivy, 1991). We chose not to stratify on baseline state negative affect because its low variability may have

limited sample recruitment. However, there were no significant differences in baseline negative affect between groups (p>.050).

Table 19: Recruitment Criteria for Study 2

Inclusion
1. Between 18 and 24 years old
2. Fluent in English
3. Available to attend experiment at The University of Texas at Austin campus
4. Possess an active Facebook.com Profile
Exclusion
1. Ineligible according to the above points
2. Qualification for Suicidality on a computer-adapted version of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997) during the in-lab screening

Research Design and Sample Size Selection

Participants were randomly assigned to one of four conditions. Two two-level factors (feedback valence, feedback condition) were completely crossed, and all possible conditions have been reported. Figure 7 depicts the experimental design. Table 20 presents the number of participants who were recruited and participated in the research study, and the number of participants included in the final sample.

We conducted power analysis using the lmmpower package in R (Donohue & Edland, 2013) to determine the necessary sample size (n=160) to identify medium (d = .5, alpha = .05, power = .8) and large (d = 1, alpha = .05, power = .8) two-way interaction effects using LMER.

MEASURES

To assess short-term reactivity to the manipulations described below for both experiments, participants completed measures of state affect (Positive and Negative Affect Schedule-X; Watson, Clark, & Telegen, 1988) and self-esteem (State Self-Esteem Scale; Heatherton & Polivy, 1991) before and after the manipulation. Information on age, gender, fear of negative evaluation, and depressive symptoms were collected before the manipulation. Age and gender were provided by the participants. Fear of negative evaluation was measured using the Brief Fear of Negative Evaluation scale (BFNE; Leary, 1983) and depressive symptoms were measured using the Beck Depression Inventory II (BDI; Beck, Steer, & Brown, 1996). Participants ranked the confederates and provided expected group rankings of each confederate (including themselves) before receiving feedback, and again after each of the two feedback rounds. Following the debrief, we measured participants' belief in the manipulation using a 5-point Likert scale. A full list of measures administered during the study is included in Table 20.

Table 20: Measures collected for Study 1, Experiments 1 and 2

Screening
Suicide Module of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997)
Pre-Manipulation
Positive and Negative Affect Schedule (PANAS, Watson, Clark & Tellegen, 1988)
State Self-Esteem Scale (SSE, Heatherton & Polivy, 1991)
Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1998)
Beck Depression Inventory-II (BDI; Beck, Steer & Brown, 1996)
Self-Compassion Scale (Neff, 2003)
Narcissistic Personality Inventory (NPI; Ames, Rose, & Anderson, 2006)
Preference for Online Social Interaction (POSI; Caplan, 2003)
Problematic Internet Use (Caplan, 2002)
Facebook Intensity Scale (Ellison, Stienfield & Lampe, 2007)
Preference for Online or Face-to-Face Evaluation (Developed for this study)
Before and After Each Feedback Round
Ranking and Expected Group Ranking (Developed for this study)
Post-Feedback Rounds
Positive and Negative Affect Schedule (Watson, Clark & Tellegen, 1988)
State Self-Esteem Scale (Heatherton & Polivy, 1991)
Post-Debrief
Manipulation Check Items (Developed for this study)

Table 21: Number of participants included in final analysis (and number of participants recruited) for Study 2

		Feedback Condition	
		Private (Facebook Messenger)	Public (Facebook Profile)
	Bullying Confederate	56(*59*)	48(*52*)
Feedback Valence	Supportive Confederate	45(*50*)	47(*54*)

PARTICIPANTS

Two hundred and twenty-four (224) undergraduate Facebook users (128 females; 111 Caucasian American, 41 Asian American, 46 Hispanic, 16 African American) between 18 and 24 (*m*=18.69, *sd*=1.03) were recruited from The University of Texas at Austin introductory Psychology subject pool and participated for course credit. Because our manipulation was hypothesized to prompt short-term distress, individuals reporting clinical symptoms of suicidality were excluded for their protection. All participants completed a computer-adapted version of the Suicidality module of the World Health Organization Mini International Neuropsychiatric Interview (WHO MINI; Lecrubier et al., 1997) during an in-lab screening session. Individuals excluded for suicidality (*n*=2) were provided immediate face-to-face support by trained clinicians through the Clinical area of the UT Psychology Department. Other reasons for exclusion included computer and experimenter error (*n*=15), and participant disengagement (*n*=3). The final sample size was 204.

EXPERIMENTAL DESIGN AND PROCEDURES

Participants were stratified on baseline positive affect and self-esteem, two variables predicted to affect response, and then randomly assigned to one of four experimental conditions: (1) Negative feedback (cyberbullying) delivered privately (Facebook Messenger); (2) Negative feedback (cyberbullying) delivered publicly (Facebook Profile); (3) Positive feedback delivered privately (Facebook Messenger); and (4) Positive feedback delivered publicly (Facebook Profile). The resulting 2 x 2 x 2 experimental design included two between-group fixed factors (feedback valence and feedback channel) and one within-subjects fixed factor (assessment occasion – pre vs. post-feedback). Figure 8 depicts the experimental design.

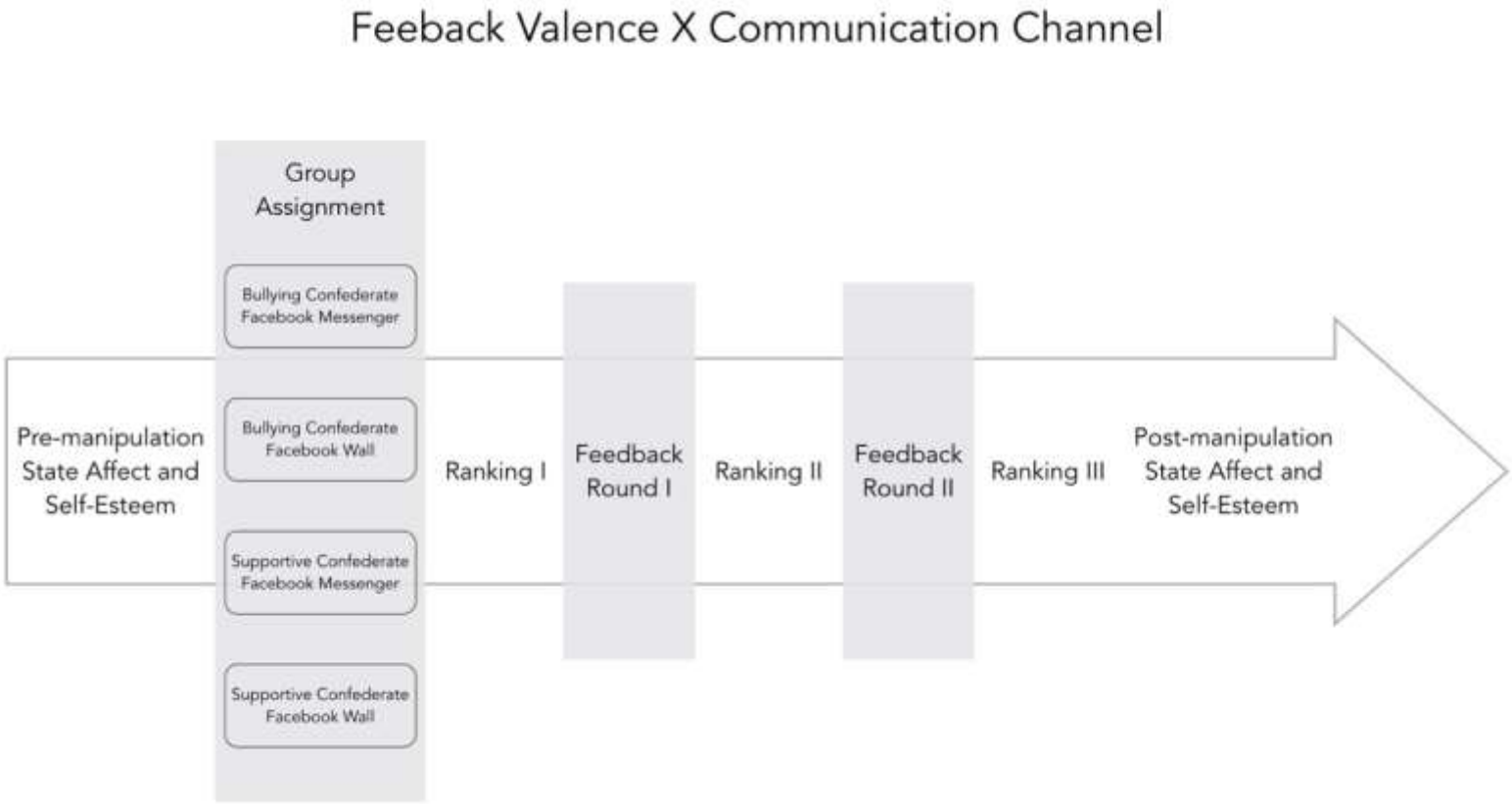


Figure 7: Experimental design for Study 2.

After participants completed pre-manipulation measures, the experimenter guided participants with confederates into a conference room in the laboratory, informing them that the purpose of the study was to learn "how students communicate online." They were told they would set up an in-laboratory Facebook Profile using an email and password given to them by the experimenter, after which they would engage in "feedback rounds" where they would comment about each other participants' Profiles, either using Facebook Messenger or commenting on one another's Facebook Profile. To increase the salience of social evaluation, participants were told they would be ranking one another's attractiveness and personality after each feedback round to determine which participant would be invited to participate in a paid research project ($50) on "extremely likeable students." The top-ranking participant would also be included in a drawing for an iPod Nano or a $140 Visa gift card.

Following this group introduction, which was delivered face-to-face in front of the group of confederates, participants were guided back to a private room. Participants spent the next five minutes preparing their in-lab Facebook Profiles. To protect the privacy of participants randomly assigned to receive public feedback, all participants (and confederates) were given a blank Facebook Profile and guided to update it using information from their real Facebook Profile. They were prompted to include at least five photographs, to like five Pages on Facebook, and to include their political and religious views, profession if applicable, current city, hometown, a quote, and a personal comment.

After completing the in-lab Facebook Profile and before the first feedback round, the experimenter used Facebook Messenger to instruct the group to visit one another's Profiles and rank one another. Next, a researcher responsible only for random assignment revealed the participant's condition to the experimenter, who messaged the group which feedback channel they would use to provide feedback (Facebook Messenger or Facebook Profile). Using Facebook Messenger, the experimenter guided participants through two five-minute rounds of feedback delivery and ranking.

During the two feedback rounds, all confederates delivered the same supportive (e.g., “you seem cool...”) or neutral (e.g., “I know some guys from [participant’s hometown]”) feedback to the participant, save for one female confederate who switched between supportive or bullying feedback according to random assignment. Participants assigned to the bullying feedback condition received bullying feedback (e.g., “PROFILE FAIL LOL”); those assigned to the supportive feedback condition received supportive feedback instead (e.g., “excellent! you and I have similar taste”).

After the second feedback and ranking round, participants completed post-manipulation measures and a binary item asking whether they would like to continue the study. Participants were then immediately debriefed and rated confederate and feedback credibility using two five-point Likert scales.

The study manipulation required the participant believe they were receiving feedback from a group of fellow undergraduates, and we took a number of steps to increase the believability of the manipulation. Prior to the study, participants and confederates were instructed to wait in the lobby of the building where the research laboratory was located. The experimenter then gathered participant and confederates and guided them to the research laboratory, where each group member was led into a different room to complete pre-manipulation measures.

Throughout the study, confederates followed a script of ‘spontaneous’ comments and questions both during face-to-face interaction and in response to the experimenter’s instructions using Facebook Messenger (e.g., "I'm finished.. what do I do now?”). To appear more natural, confederates were assigned scripted replies in case participants complimented them (e.g., “thanks!”) or asked them specific questions (e.g., “brb I've gotta go finish up this stuff”). To provide believable context around the feedback confederate’s bullying behavior, that confederate’s in-lab Facebook Profile included moody content (e.g., “This study sucks, just want to get it over with”) and the confederate gave bullying

feedback to other confederates (e.g., “wow. you really think that's a good picture of you?”) when feedback channel assignment was public.

Feedback Valence Manipulation

Participants were randomly assigned to receive bullying or supportive feedback about their in-laboratory Facebook Profile from a female confederate. All other confederates gave the same scripted neutral or supportive feedback regardless of assignment. Feedback was delivered verbatim either through Facebook Messenger or on the participant’s in-laboratory Facebook Profile. Participants received feedback in two feedback rounds, during which they were also prompted to provide feedback either through Facebook Messenger or on confederates’ in-laboratory Facebook Profiles. Table 22 presents feedback scripts for bullying and supportive feedback.

Table 22: Scripts for bullying and supportive feedback for Study 2

Supportive Feedback
Round 1: “I like your photos!!”
Round 2: “Looking good!”
Bullying Feedback
Round 1: “EPIC PROFILE FAIL LOL”
Round 2: “out of the thousands of photos, you choose that one.”

	C (Supp/Neut)	D (Bully)	E (Supp)	F (Neut/Supp)	G (Neut)	PPT - H	Feedback Pace
From							
A (Sup)	*you seem like an interesting person.*	*really cool!*	*i think you did a good job!*	*good pics!*	*your profile looks good!*	*i like it!*	
B (Sup)	*this is a really good picture*	*LA seems really cool*	*nice picture*	*looks like you had a lot of fun*	*cute dog*	*you seem nice*	
C (Sup)		you're from la? that's awesome i love california! :)	Lol I like your quote	You seem like a really cool, chill person :)	The Flaming Lips are awesome!	I really like your taste in [insert "like" category]	**AFTER**
D (Bully)	this profile looks totally stupid, i have absolutley no idea what ur trying to do with this		this looks fine	ok I guess.	yeah right! this can't be what ur real fb profile looks like lol	EPIC PROFILE FAIL LOL	**BEFORE**
E (Supp)	LOVE Panera Bread. So jealous!!	Foo Fighters! Which song is your favorite?		Nice cover photo!	Looks good!	I think your profile looks pretty good :)	**AFTER**
F (Neut/Supp)	I don't really know what to say D:	You seem normal lol. Not much to say.	Yay, a fellow political enthusiast!		Interpol is literally the best band ever.	Your profile's alright. ;P	**BEFORE**
G (Neut/Supp)	Dallas is a really fun city. Cool!	didn't interest me one way or the other	lol can you get me a discount on some vans??	i think you did a good job		I think my aunt used to live in [hometown].	**BEFORE**
PPT							
	To Reply to feedback: C, E & F can like posts. ALL can use an appropriate reply from the Reply Bank (First Tab). Coordinate with each other so not everybody uses the same reply every time. Reply should match your character (Neutral/Supportive/Bullying)						

Figure 8: Script matrix used for feedback for confederates and participants used during the public bullying condition in Study 2.

Blue cells indicate positive feedback, red cells indicate neutral feedback, yellow cells indicate bullying feedback.

Feedback Channel Manipulation

Each confederate delivered scripted feedback to participants after the experimenter announced that the feedback period had begun. Participants were randomly assigned to receive feedback either privately, through Facebook Messenger, or publicly, on in-laboratory Facebook Profiles set up specifically for participation in this study. The feedback channel was announced to the group and all confederates delivered feedback using the assigned channel. Regardless of condition, the feedback script was delivered verbatim, and participants received the feedback in the room where they completed baseline and follow-up assessments.

Participants in the Facebook feedback channel condition received their assigned feedback through the Facebook messenger chat client. Because Facebook messenger reveals when users are typing, confederates typed the scripted feedback using short phrases to emulate the cadence of natural typing.

Post-Manipulation Instruction Set

Participants completed post-manipulation measures after two five-minute rounds of peer feedback. Participants were not aware that the study was over at this point, however; they were told that they would be asked to fill out psychosocial measures after every two feedback rounds for a total of ten rounds. Instructions for pre- and post-manipulation measures asked participants to report their feelings in the moment.

Debriefing

Immediately after completing post-manipulation measures, the experimenter entered the participant's assessment room and delivered a scripted debrief. The experimenter informed the participant of the true nature of the manipulation, described the participant's specific condition, and explained the purpose of the deception used in the study. The experimenter encouraged the participant to refrain from discussing the manipulation with other students to maintain the integrity of the manipulation. All debriefing was delivered face-to-face. All participants (n=224) consented to the use of their data and signed the debrief form.

After being debriefed, participants were asked to answer two manipulation check items. One asked participants to rate the credibility of the confederates using a 5-point Likert scale (0=*I fully believed that the group members were PSY301 students.* 4=*I was sure that the group members were* not *PSY301 students.*). The other asked participants to rate the credibility of the feedback delivered by the confederates (0=*I fully believed that the feedback was genuine.* 4=*I was sure that the feedback was* not *genuine.)*

ANALYTIC STRATEGY

To compare the effects of public and private Facebook-mediated feedback on affect, self-esteem, and self- and other-rankings change, we estimated hierarchical linear mixed effects regression models (LMER). LMER allows for comparison of change between groups while accounting for correlation between repeated measures.

We estimated regression coefficients using restricted maximum likelihood (REML). We used nonparametric bootstrapping procedures (n=10,000) to estimate confidence intervals and permutation tests (n=10,000) to estimate *p* values for LMER models when model residuals were not normally distributed (Shapiro-Wilk *p*s < .100), as was the case for state negative affect and state self-esteem[2]. When residuals were normally distributed, as was the case for state positive affect, we used the likelihood-ratio test to estimate p_{LRT} values. Similarly, for follow-up t-tests we used nonparametric bootstrapping procedures (n=10,000) to estimate confidence intervals, and parametric tests (n=10,000) to calculate *p* values when the data was not normally distributed.

Standardized regression coefficients (β) were included to provide an estimate of effect size. Binary variables were dummy coded (e.g., 0=*Facebook Messenger*, 1=*Facebook Profile*) and all predictors grand mean centered. Variables expected to affect reactivity (initial scores on outcome variables, fear of negative evaluation, participants' ratings of their evaluators, gender, and age) were tested as intercept-level covariates during model selection for all LMER models. Because the number of available confederates varied based on undergraduate research assistants' availability, rankings were standardized to account for differences in number of group members. Controlling for artifacts of running the manipulation, like participant suspicion about the manipulation and number of confederates, did slightly increase effect sizes, but did not alter any study conclusions. As a result, these variables were not included in our hypothesized models.

[2] We chose not to transform the variable as transformations have been found to decrease estimates of true moderator effects (Russell & Dean, 2000).

To examine the nature of interactions between the experimental factors, we followed the procedure recommended by Aiken and West (1991), which computes the model-based predicted effect of one experimental factor at different levels of the other. For three-way interactions, we compared the model-based predicted slopes for two experimental factors at different levels of the third. This approach has the advantage of using all the data from all participants to calculate the effect of the intervention, as opposed to examining the intervention effects separately within different subsamples.

We reported *p*s<.100 and considered *p*s<.050 statistically significant. Follow-up *t*-tests of predicted values are two-sided.

RESULTS

Manipulation Check

Table 23 presents the distribution of participant belief in the manipulation by group Study 2. Participants who endorsed 0 (*I was sure that the group members were **not** PSY301 students.*) or 1 (*I had strong doubts [they were]*) on the post-debrief confederate manipulation check (*n*=17,8.5%) were considered suspicious. Similarly, participants who endorsed 0 (*I was sure that the feedback was **not** genuine.*) or 1 (*I had strong doubts [it was]*) on the post-debrief feedback manipulation check (*n*=21,10.5%) were considered suspicious. Group assignment had no appreciable effect on suspicion (*p*>.100). Table 24 presents the distribution of participant belief for the two manipulation check items in Study 2.

Participant responses to feedback also indicated belief in the manipulation. In response to supportive feedback some participants gave similarly supportive feedback (e.g., “I like your dress”, “that’s a nice photo”). In response to bullying feedback, some participants acknowledged the bullying, saying things like: “um, excuse me??”, “And I was so nice to you!”, and “I’m sorry you feel that way. I’m really proud of all my photos.”

These responses suggested that participants were engaged in the manipulation and took peer feedback seriously.

Descriptive Statistics

Table 25 presents demographics and descriptive statistics for outcome variables related to emotional reactivity – state positive affect (PA), state negative affect (NA), and state self-esteem (SE) – for each group in Study 2. Table 26 presents descriptive statistics for sociometric outcome variables: Participant Rankings of the Confederate, Expected Group Rankings of the Confederate, and Expected Self Rankings for each group in Study 2. Table 27 presents descriptive statistics for covariates – age, gender, fear of negative evaluation (FNE), depressive symptoms (BDI)– for each group in Study 2. There were no appreciable between-group differences on baseline measures of emotional reactivity (*p*s>.100). Zero-order correlation tables are presented in Table 28.

Table 23: Participant Belief in Manipulation for Study 2 by Experimental Condition

	Private Feedback (Messenger)		Public Feedback (Profile)	
	Supportive	Bullying	Supportive	Bullying
Believed Confederates	40	51	42	42
Suspicious of Confederates	4	5	3	5
Believed Feedback	43	46	43	40
Suspicious of Feedback	1	11	2	7

Table 24: Participant belief in the manipulation for Study 2

0 Did not believe	1	2	3	4	5	6	7	**8** Fully believed
1 (0.01%)	2 (0.01%)	7 (0.04%)	8 (0.04%)	8 (0.04%)	20 (10.10%)	34 (17.17%)	40 (20.20%)	78 (39.39%)

Table 25: Adjusted Means and Standard Deviations for State Positive Affect (PA), State Negative Affect (NA) and State Self-Esteem (SE) by Condition for Study 2

	Supportive Feedback (N=100)				Bullying Feedback (N=112)			
	Private (FB Messenger; N=50)		Public (FB Profile; N=50)		Private (FB Messenger; N=60)		Public (FB Profile; N=52)	
	30 female, Age=18.67 (0.97)		*26 female, Age=18.63 (1.09)*		*35 female, Age=18.70 (0.89)*		*32 female, Age=18.82 (1.22)*	
	Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
Positive Affect								
Mean	18.54	18.95	18.63	18.86	20.20	17.26	19.75	17.71
SD	*0.06*	*0.06*	*0.06*	*0.06*	*0.08*	*0.08*	*0.06*	*0.07*
Negative Affect								
Mean	3.93	3.52	4.28	3.17	3.52	3.95	3.69	3.77
SD	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
Self-Esteem								
Mean	55.04	58.76	54.79	59.01	54.16	59.66	56.20	57.58
SD	*0.42*	*0.43*	*0.43*	*0.44*	*0.58*	*0.59*	*0.45*	*0.46*

FB=Facebook.com social networking website; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

Table 26: Zero-order Correlations Between Covariates and Post-Manipulation Reactivity Measures for Study 2

	PANAS PA	PANAS NA	SSE
PANAS PA	--	0.10	0.22[b]
PANAS NA	--	--	-0.49[a]
SSE	--	--	--

PANAS PA: Post-manipulation State Positive Affect
PANAS NA: Post-manipulation State Negative Affect
SSE: Post-manipulation State Self-Esteem
[a] *p </= .001* [b] *p </= .005* [c] *p </= .025* [d] *p </= .050* [e] *p </= .100*

Table 27: Means and Standard Deviations for Participant Ranking of the Confederate, Participant Expected Group Rankings of the Confederate, and Participant Expected Group Rankings of Self

	Supportive Feedback (N=95)						*Bullying Feedback (N=107)*					
	Private (FB Messenger; N=45)			*Public (FB Profile; N=47)*			*Private (FB Messenger; N=57)*			*Public (FB Profile; N=47)*		
	Pre-feed.	*Feed. 1*	*Feed. 2*	*Pre-feed.*	*Feed. 1*	*Feed. 2*	*Pre-feed.*	*Feed. 1*	*Feed. 2*	*Pre-feed.*	*Feed. 1*	*Feed. 2*
Personality Rankings												
Confederate												
Mean	3.33	3.50	3.69	3.43	2.66	2.72	4.46	4.92	2.57	2.63	4.88	4.90
SD	*1.63*	*1.52*	*1.69*	*1.53*	*1.71*	*1.31*	*1.46*	*0.97*	*1.63*	*1.30*	*1.15*	*1.01*
Expected of Confederate												
Mean	3.67	4.00	4.57	4.06	3.13	3.83	5.11	5.73	3.26	3.51	5.84	5.98
SD	*1.81*	*1.60*	*1.81*	*1.76*	*1.77*	*1.73*	*1.63*	*1.15*	*1.93*	*1.43*	*1.18*	*0.86*
Expected of Self												
Mean	2.56	2.81	2.50	2.29	2.31	2.65	2.26	2.63	2.44	2.45	2.37	2.41
SD	*1.32*	*1.75*	*1.53*	*1.32*	*1.10*	*1.54*	*1.30*	*1.44*	*1.31*	*1.40*	*1.37*	*1.22*

Attractiveness Ratings												
Confederate												
Mean	3.07	3.33	3.28	3.07	2.80	3.20	4.13	3.98	2.80	2.93	4.53	
SD	*1.76*	*1.77*	*1.80*	*1.66*	*1.79*	*1.72*	*1.58*	*1.60*	*1.71*	*1.60*	*1.35*	*1.53*
Expected of Confederate												
Mean	3.19	3.69	3.85	3.15	3.20	3.79	4.44	4.56	3.37	3.46	4.84	4.86
SD	*1.79*	*1.89*	*1.96*	*1.68*	*1.73*	*1.98*	*1.99*	*1.81*	*1.80*	*1.82*	*1.90*	*1.74*
Expected of Self												
Mean	2.74	2.73	2.73	2.42	2.91	2.77	2.84	2.69	2.84	2.96	2.86	2.76
SD	*1.54*	*1.81*	*1.65*	*1.60*	*1.52*	*1.70*	*1.82*	*1.75*	*1.33*	*1.79*	*1.72*	*1.57*

The Effect of Feedback Valence and Feedback Channel on State Positive Affect, State Negative Affect, and State Self-Esteem Change.

Figure 9 presents standardized mean change, or effect size of change (d), in emotional reactivity for the four experimental groups, and Table 29 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized model for each of the three outcome variables.

As hypothesized, feedback channel prompted NA change (p<.050). Participants in the public feedback conditions reported a decrease in negative affect, b=-0.54 [-0.67, -0.41], $t(82)$=44.37, p<.001, d=-1.28 [-1.62, -0.94], while participants in the private feedback conditions reported no appreciable change in NA (p>.100). Given that the majority of feedback participants received was neutral or supportive, this suggests that public feedback was more beneficial than private feedback.

Feedback valence prompted PA change (ps<.050). Bullying feedback decreased PA, b=-2.54 [-1.09, -0.59], $t(88)$=50.69, p<.001, d=-7.60 [-8.45, -6.75], whereas supportive feedback had no appreciable effect on PA (p>.100). There was evidence that feedback prompted NA change, but it was not statistically significant (p<.100). There was no appreciable main effect of feedback on SE (p>.100).

As hypothesized, feedback channel and feedback valence interacted to affect SE (p<.050). Overall, participants reported an increase in SE following the experiment, m_{diff}=4.58 [2.59, 6.58], $t(133)$=33.28, p<.001, d=2.88 [1.63, 4.14], possibly because the majority of feedback delivered was positive or neutral. Bonferroni-corrected post-hoc comparisons showed the post-feedback boost in self-esteem was the same for participants bullied privately as it was for participants who received supportive feedback (ps<.05). However, unlike the other three groups, participants who received public bullying feedback face-to-face did not report any appreciable increase in SE (p>.100), suggesting that public

rejection, but not private rejection, had a negative impact on self-esteem. There were no other appreciable main or interactive effects of feedback channel on PA or NA (*p*s>.100).

Figure 9: Results from Study 2.

Predicted standardized mean change (*d*) in affect and self-esteem for participants receiving supportive or bullying feedback as a function of feedback channel. Error bars represent 95% confidence intervals. Analysis shows a main effect of feedback channel on NA, but not PA or SE. Public feedback decreased NA ($p<.050$); private feedback had no appreciable effect. There was a main effect of feedback valence on PA: bullying decreased PA ($p<.050$) but supportive feedback had no appreciable effect. Feedback channel and feedback valence interacted to affect SE ($p<.050$). Most participants reported an increase in SE, possibly because the majority of feedback was positive or neutral. However, unlike the other three groups, participants who received public bullying feedback face-to-face did not report any appreciable increase in SE ($p>.100$).

Table 28: Unstandardized and Standardized Regression Coefficients for Effects of Experimental Variables and Covariates in Study 2

	Response Variables																	
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE) #					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
Belief in Manipulation	0.55	-2.36	1.57	0.04	-0.05	0.03	-0.02	-0.11	2.18	0.00	-0.01	0.12	-0.08	-4.70	-0.91	-0.01	-0.14	-0.03
Time	3.74	2.80	4.72	0.15	0.11	0.19	-0.22	-0.80	0.34	-0.02	-0.09	0.04	-1.14	-2.10	-0.22	-0.07	-0.12	-0.01
Feed. Chann.	-1.87	-0.81	1.17	-0.04	-0.11	0.16	-0.52	-0.23	0.40	-0.03	-0.09	0.16	0.38	-0.92	0.33	0.01	-0.19	0.07
Feed. Val.	-0.80	-3.76	0.10	-0.02	-0.07	0.00	1.02	-1.66	0.66	0.06	-0.09	0.04	-2.78	-1.55	2.28	-0.08	-0.04	0.07
Feed. Chann. * Feed. Val	-4.77	-8.47	-0.61	-0.05	-0.08	-0.01	0.36	-1.92	2.62	0.01	-0.05	0.07	1.10	-2.64	4.86	0.02	-0.04	0.07

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), Beta=standardized regression coefficients; Eval. Med.=Evaluation channel; Feed. Val.=Feedback Valence; Comm. Ch.=Communication channel; FNE=Fear of Negative Evaluation as measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983); Eval. Ratings=Participants'' ratings of evaluators measured by three items assessing likability, attractiveness, & relatability; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

The Effect of Feedback Valence and Feedback Channel on Participant Rankings of the Confederate, Expected Group Rankings of the Confederate, and Expected Self Rankings.

Figure 10 presents participants' standardized rankings over time for each group, and Table 29 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized model for each of the three outcome variables.

Participants gave their personal ranking of the confederate, they also gave the ranking they expected the group to give the confederate and themselves. Overall, participants expected the group to give the confederate lower rankings after feedback, m_{diff}=-0.35 [-0.46, -0.25], $t(152)$=-7.36, p<.001, d=-0.59 [-0.75, -0.44], regardless of condition. Participants also expected the group to give them higher-than-average rankings, (m_{diff}=0.54 [0.28, 0.78], $t(230)$=-15.21, p<.001, d=1.00 [0.53, 1.47]), regardless of condition.

Feedback channel affected participants' expected group rankings of the confederate, and the effect was curvilinear over time (p<.050). Participants in public feedback conditions lowered their expected ranking, m_{diff}=-0.47 [-0.29, -0.64], $t(73)$=-5.93, p<.001, d=-0.68 [-0.94, -0.44], more than did participants in private feedback conditions, m_{diff}=-0.25 [-0.13, -0.37], $t(78)$=-4.55, p<.001, d=-0.51 [-0.76, -0.26]. Participants in the public condition exhibited rankings change after the first round of feedback, m_{diff}=-0.25 [-0.31, -0.20], $t(78)$=-9.45, p<.001, d=-1.06 [-1.29, -0.83], but not the second round of feedback (p>.100). Participants in the private condition exhibited greater rankings change after the second round of feedback, m_{diff}=-0.46 [-0.59, -0.33], $t(73)$=-7.01, p<.001, d=-0.82 [-0.86, -0.49], but not the first (p>.100). There was no appreciable effect of feedback channel on participants' personal rankings of the confederate or of themselves (ps>.100).

Feedback valence affected participants' own rankings of the confederate (p<.050). As hypothesized, participants receiving supportive feedback increased their ranking of the confederate after feedback, m_{diff}=0.32 [0.29, 0.34], $t(60)$=23.34, p<.001, d=2.99 [2.74,

3.24], whereas those in the bullying condition decreased their ranking of the confederate after feedback, m_{diff}=-0.70 [-0.65, -0.76], $t(64)$=-10.35, p<.001, d=-3.29 [-3.54, -3.03]. This effect was curvilinear over time (p<.050) such that the changes in rankings for both groups were greater after the first feedback round than they were after the second feedback round.

Feedback valence also affected participants' expected group rankings of the confederate (p<.050). Participants in the bullying condition decreased their expected rankings of the confederate after feedback, m_{diff}=-0.83 [-0.73, -0.92], $t(78)$=-19.66, p<.001, d=-2.21 [-2.46, -1.96], while those in the supportive condition increased their expected ranking of the confederate, m_{diff}=0.15 [0.07, 0.23], $t(73)$=-19.66, p<.001, d=0.49 [0.24, 0.74]. The effect of feedback on expected group rankings was curvilinear over time (p<.050) such that bullying feedback led to steeper ranking decreases after the first feedback round than after the second feedback round.

There was an interactive effect of feedback valence and feedback channel on participants' expected rankings of the confederate (p<.050). Although most participants expected rankings for the confederate to decrease after feedback, participants who received public supportive feedback did not appreciably change their rankings for the confederate over time (p>.100), suggesting that public supportive feedback had a protective effect on participants' otherwise negative evaluations of the confederate.

There was no appreciable effect of feedback valence or feedback channel on participants' expected group rankings of themselves (ps>.100). Participants gave themselves higher-than-average rankings regardless of feedback condition (m_{diff}=0.54 [0.28, 0.78], $t(230)$=-15.21, p<.001, d=1.00 [0.53, 1.47]).

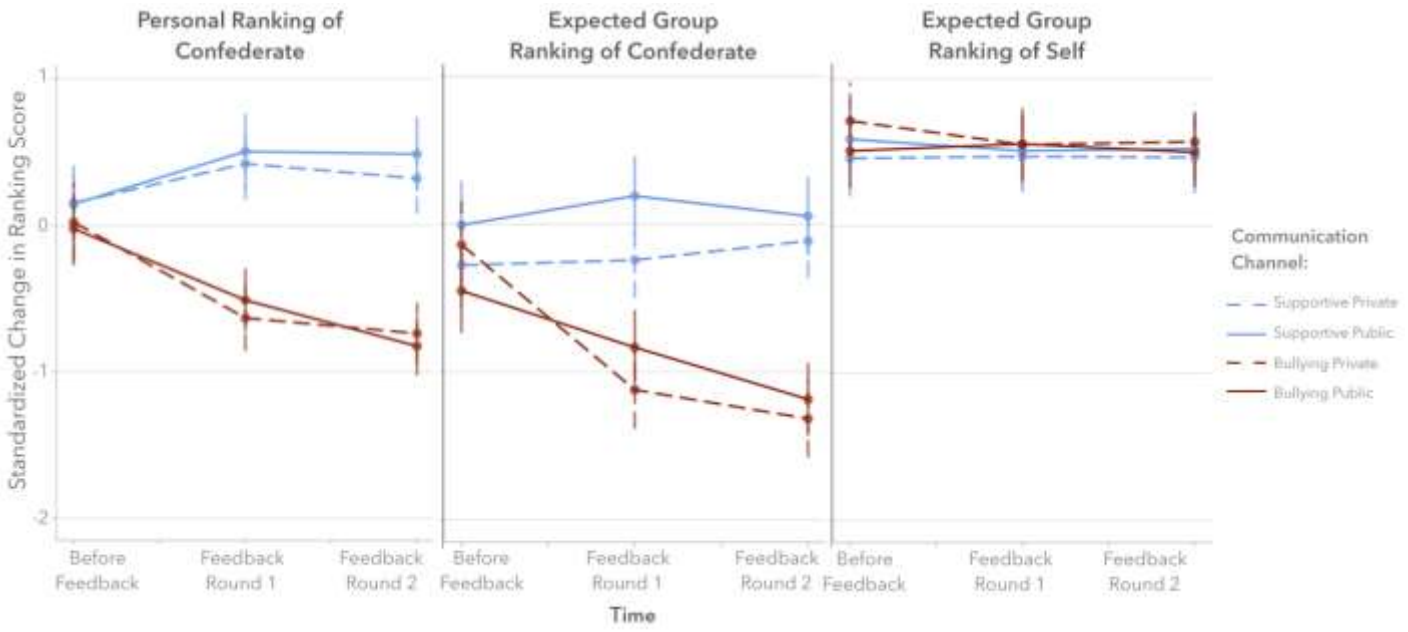


Figure 10: Results from Study 2.

Predicted standardized rankings given by participants receiving supportive or bullying feedback as a function of feedback channel. Error bars represent 95% confidence intervals. Feedback channel affected expected group rankings of the confederate: public conditions lowered their expected ranking more than private conditions (p<.050). There was no appreciable effect of feedback channel on participants' own rankings of the confederate or expected group rankings of themselves (ps>.100). Feedback valence affected participants' own rankings of the confederate (p<.050): support increased rankings of the confederate; bullying decreased it (p<.050). Feedback valence also affected expected group rankings of the confederate (p<.050). Bullying decreased expected rankings of the confederate; support increased expected rankings. Feedback valence and feedback channel interacted to affect expected rankings of the confederate(p<.050). Although most participants expected rankings for the confederate to decrease, public supportive feedback did not appreciably change rankings for the confederate (p>.100), suggesting that public supportive feedback improved otherwise negative evaluations of the confederate. There was no appreciable effect of feedback valence or feedback channel on participants' expected group rankings of themselves (ps>.100). Participants gave themselves higher-than-average rankings regardless of feedback condition.

Table 29**:** Standardized Regression Coefficients for Effects of Experimental Variables on Rankings of Confederate and Expected Rankings of Confederate and Self

	Confederate Rank	Expected Group Confederate Rank	Expected Group Participant Rank
	Std. Beta [95% CI]	*Std. Beta [95% CI]*	*Std. Beta [95% CI]*
Intercept-Level Coefficients			
Suspicion	0.02 [-0.19, 0.21]	-0.11 [-0.13, 0.34]	-0.05 [-0.29, 0.17]
Communication Channel	0.04 [-0.20, 0.28]	-0.37 [-0.62, -0.11]	-0.01 [-0.25, 0.24]
Feedback Valence	-0.12 [-0.36, 0.13]	-0.95 [-1.23, -0.68]	0.08 [-0.18, 0.33]
Feedback Valence X Communication Channel	0.04 [-0.44, 0.54]	0.14 [-0.40, 0.65]	0.06 [-0.44, 0.55]
Slope-Level Coefficients			
Time (Linear)	-0.13 [-0.32, 0.06]	-0.34 [-0.44, -0.24]	-0.04 [-0.12, 0.03]
Time (Quadratic)	0.00 [-0.09, 0.09]	0.19 [-0.03, 0.41]	0.05 [-0.13, 0.23]
Communication Channel (Linear)	-0.24 [-0.62, 0.14]	-0.12 [-0.33, 0.09]	-0.03 [-0.18, 0.13]
Communication Channel (Quadratic)	-0.10 [-0.08, 0.28]	0.79 [0.35, 1.24]	0.11 [-0.25, 0.47]
Feedback Valence (Linear)	-1.28 [-1.67, -0.88]	-0.90 [-1.11, -0.70]	-0.02 [-0.17, 0.14]
Feedback Valence (Quadratic)	0.37 [0.18, 0.55]	0.71 [0.26, 1.15]	0.01 [-0.36, 0.36]
Feedback Valence X Communication Channel (Linear)	-0.26 [-1.05, 0.52]	-0.44 [-0.84, -0.03]	-0.15 [-0.48, 0.16]
Feedback Valence X Communication Channel (Quadratic)	0.18 [-0.18, 0.55]	-0.46 [-0.43, 1.35]	-0.51 [-0.20, 1.23]

In summary, public bullying feedback affected both participants' self-esteem reactivity and their perceptions of the bully's sociometric status. Participants who received public bullying feedback reported no appreciable boost in self-esteem following the feedback manipulation. All other participants, including those receiving private bullying feedback, reported a boost in self-esteem, suggesting they were largely reacting to feedback from the confederates who gave supportive or neutral feedback. For participants who received public bullying feedback, however, bullying feedback from a single confederate negated any self-esteem boost from the supportive and neutral feedback shared by other confederates. Participants in the private bullying condition reported a self-esteem boost in spite of bullying feedback from one confederate, suggesting it was the combination of bullying feedback and public audience that had such a strong effect on self-esteem for participants in the public bullying condition.

Overall, regardless of group assignment, participants expected the group to give the confederate lower rankings after feedback. This is likely because the confederate's Facebook Profile and scripted interactions with other participants were developed to be less likeable (so as to make any bullying feedback they provided the participant more believable). As a result, even participants receiving supportive feedback lowered the confederate's ranking following feedback.

However, the data indicates that participants who received public bullying feedback expected the bullying confederate's behavior would have social consequences. Participants' expected decreases in group ranking when the confederate gave bullying feedback to the participant, especially when the confederate gave bullying feedback to the participant publicly, using the Facebook Profile. This suggests that participants expected other group members might see the bully's behavior and evaluate her negatively.

The data also indicates participants expected public supportive feedback to have social benefits for the confederate. Although all other groups decreased their expected group rankings of the confederate over the course of the manipulation, participants who received supportive public feedback did not decrease their rankings of the confederate. This suggests participants expected group members to see the confederate's positive feedback and evaluate her more positively.

Consistent with the illusory superiority bias, participants expected the group to rank them above the group average, regardless of group assignment. Contrary to hypotheses, bullying feedback did not decrease the ranking participants expected the group would give them, indicating that bullying feedback did not decrease participants' perceptions of their social status.

DISCUSSION

We investigated whether public cyberbullying feedback prompted more reactivity than private cyberbullying feedback by comparing responses to feedback delivered either on the Facebook Profile (a semi-public space) or via Facebook's private Messenger client. We measured participants' emotional states before and after peer feedback, and we also asked them to provide rankings of themselves and the other confederates. We expected participants would have greater emotional reactivity to public feedback than to private feedback, and we expected participants' rankings would be more reactive to public feedback than to private feedback.

In an experiment with undergraduates who believed they were evaluated to determine whether they were the "most likeable" student in the group, public bullying feedback was more damaging to self-esteem than private bullying feedback. Both types of bullying (private and public) had negative interpersonal consequences for the bullying

confederate – after receiving bullying feedback, participants decreased their personal rankings of the confederate and they expected the group to do so as well. Those decreases were greater when the confederate gave public bullying feedback to the participant, suggesting they expected the group to have a negative response to bullying behavior. However, our manipulation did not cause any appreciable changes in participants' self-rankings – participants gave themselves relatively high rankings regardless of what condition they were assigned to.

Our finding that public Facebook bullying had more negative consequences than private bullying is consistent with the literature suggesting public bullying may be more damaging than private bullying. More public forms of bullying are perceived as worse than private forms of bullying (Slonje & Smith, 2008; Nocentini et al., 2010), and people react more strongly to public feedback than they do to private feedback (Leary, Cottrell, & Phillips, 2001). Unexpectedly, in our study private bullying seemed to have no effect on self-esteem reactivity in the context of other peer feedback that was positive.

Our research contributes to the growing body of literature on the effects of cyberbullying on self-esteem. Our finding that public bullying is worse than private bullying is consistent with perceptions that public bullying is more harmful, whether face-to-face (Slonje & Smith, 2008; Nocentini et al., 2010) or online (Sticca & Perren, 2012). Because the negative consequences of cyberbullying can be so severe – it is often associated with anxiety (e.g., Dempsey, Sulowski, Nichols & Storch, 2009), reduced self-esteem (e.g., Houlston, Smith & Jessel, 2011; Patchin & Hinduja, 2010), and depression (e.g., Sontag, Clemens, Graber & Lyndon, 2011; Ybarra, 2004), our research suggests that understanding the relative impact of private and public bullying feedback could inform targeted interventions that could save children's lives.

Study 3: Moderators of the Effects of Feedback Channel on Emotional Reactivity to Cyberbullying Feedback on Facebook

Demographic and psychosocial variables (e.g., gender, social anxiety, and depression) could influence emotional reactivity to public bullying feedback. For instance, women are more reactive to private rejection feedback than are men (Romero-Canyas & Downey, 2005). When preadolescent girls imagine future rejection, they anticipate having stronger negative reactions to rejection than preadolescent boys do (Reijntjes, Stegge & Terwogt, 2006). As another example, pre-adolescents with higher social anxiety symptoms show more emotional reactivity than their peers (Reijntjes, Dekovic, & Telch, 2007; Reijntjes et al., 2011). Because symptoms of social anxiety often include exaggerated fears of negative evaluation (Clark & Wells, 1995), and because public rejection is considered worse than private rejection (Slonje & Smith, 2008; Nocentini et al., 2010), one would expect people with social anxiety symptoms to have stronger reactions to public feedback than to private feedback. Lastly, children with depressive symptoms anticipate more distress when imagining a rejection scenario than do their peers, and they are less likely to endorse effective coping strategies to regulate their responses to rejection (Reijntjes, Stegge & Terwogt, 2006).

In Study 2, we investigated whether public cyberbullying feedback prompted more reactivity than private cyberbullying feedback by comparing responses to feedback delivered either on the Facebook Profile (a semi-public space) or via Facebook's private Messenger client. Public bullying feedback had a stronger effect on participants' emotional reactivity than did private bullying feedback. Participants who received public bullying feedback in Study 2 reported no appreciable boost in self-esteem during the feedback manipulation. All other participants, including those receiving private bullying feedback,

reported a boost in self-esteem, suggesting they were reacting to feedback from the other confederates, who gave supportive or neutral feedback. For participants who received public bullying feedback, bullying from a single confederate negated the self-esteem boosting effect of the feedback from other confederates. Participants in the private bullying condition did receive a self-esteem boost in spite of the bullying, suggesting it was the combination of bullying feedback and public audience that had such a strong effect on self-esteem for participants in the public bullying condition.

In this study, we investigated whether demographic and psychosocial variables moderate emotional reactivity to public and private bullying feedback on Facebook. We measured gender, fear of negative evaluation, and depressive symptoms before the delivery of controlled manipulations of two factors: feedback valence and feedback channel. We then analyzed whether those variables had an influence on participants' emotional reactivity to the experimental manipulation.

SPECIFIC AIMS AND HYPOTHESES

To understand how gender, fear of negative evaluation (a risk factor for social anxiety), and depressive symptoms moderate emotional reactivity to public and private bullying feedback on Facebook, we conducted moderation analyses on the data collected during Study 2.

Gender. Compared to men, women are more reactive to private rejection feedback, and anticipate more negative affect in response to rejection (Romero-Canyas & Downey, 2005; Reijntjes, Stegge & Terwogt, 2006). As a result, we expected female participants to have stronger emotional reactions to private feedback than to public feedback.

Fear of Negative Evaluation: People with high fear of negative evaluation are concerned with the perceptions of others (Clark & Wells, 1995). We expected fear of negative evaluation to amplify participants' responses to feedback.

Depressive symptoms: Children with depressive symptoms anticipate more distress when imagining a rejection scenario and are less likely to endorse effective coping strategies to manage their reaction to rejection (Reijntjes, Stegge & Terwogt, 2006). We expected rejection to prompt a stronger negative response in participants with more depressive symptoms.

MEASURES

Prior to the experimental manipulation, participants completed measures of potential moderating factors, including gender, fear of negative evaluation, and depressive symptoms. Fear of negative evaluation was measured using the Brief Fear of Negative Evaluation scale (Leary, 1983). Depressive symptoms were measured using the Beck Depression Inventory-II (Beck, Steer, & Brown, 1996).

ANALYTIC STRATEGY

To test whether gender, fear of negative evaluation, and depressive symptoms moderated the hypothesized interaction between feedback valence and feedback channel on change in state positive affect, state negative affect, and state self-esteem, we followed the MacArthur guidelines for moderation (Kraemer, Wilson, Fairburn, & Agra, 2002; Kraemer, Kiernan, Essex, & Kupfer, 2008). We measured all three moderators prior to the experimental manipulation, meeting the temporal precedence requirement for moderation. Participants were randomly assigned to experimental conditions regardless of their gender, level of fear of evaluation, or number of depressive symptoms endorsed, making these variables independent from each of the two manipulated independent variables (a second

requirement for moderation). Lastly, moderation was only reported when the moderator interacted significantly (p<.050*)* with one or the other manipulated experimental factor (although we reported all effects with ps<.100). Specifically, we conducted separate analyses for each of the moderators, including four additional terms to the model tested in Study 2: the moderator as an independent predictor, the moderator in interaction with each of the experimental variables, and the moderator in interaction with the hypothesized interaction between the two experimental variables.

To examine the nature of interactions between the moderator and the experimental factors, we followed the procedure recommended by Aiken and West (1991), which computes the model-based predicted effect of the experimental manipulation at different levels of the moderator. For three-way interactions, we compared the model-based predicted slopes of two experimental factors at different levels of the moderator before exploring group effects. This approach has the advantage of using all the data from all participants to calculate the effect of the intervention, as opposed to examining the intervention effects separately within different subsamples.

RESULTS

Gender

There was no appreciable main effect of gender on any of the outcome variables, and gender had no appreciable moderating effect on any of the experimental factors (ps>.100). Figure 11 presents standardized mean change, or effect size of change (d), in affect and self-esteem for the four experimental groups for each gender, and Table 30 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized moderation model for each of the three outcome variables.

Fear of Negative Evaluation (FNE)

Regardless of their assigned experimental condition, participants with high FNE (1 SD above the mean) reported larger pre to post-manipulation increases in SE, *b*=7.13 [3.26, 10.59], *t(30)*= 4.00, *p*<.005, *d*=1.02 [0.48, 1.56], than participants with low FNE (1 SD below the mean), *b*=4.05 [2.19, 6.26], *t(28)*= 4.00, *p*<.005, *d*=1.07 [0.5, 1.63]. FNE further moderated the effect of feedback channel on self-esteem change (*p*<.050). Specifically, participants with high FNE who received private feedback reported greater overall increases in SE, *b*=9.05 [4.71, 13.21], *t(19)*= 4.43, *p*<.001, *d*=1.40 [0.69, 2.12], than participants with low FNE, *b*=3.09 [4.71, 13.21], *t(10)*=3.60, *p*<.050, *d*=1.54 [4.71, 13.21]. There was no appreciable main effect of FNE on feedback channel for PA or NA, nor on feedback valence for any of the outcome variables (*p*s>.100). FNE did not moderate the interaction between feedback valence and feedback channel for any of the outcome variables (*p*s>.100). Figure 12 presents standardized mean change, or effect size of change (*d),* in outcome for the four experimental groups for high and low FNE, and Table 31 presents unstandardized betas and standardized betas with bootstrapped 95% CIs (*n*=10,000) for the hypothesized moderation model for each of the three outcome variables.

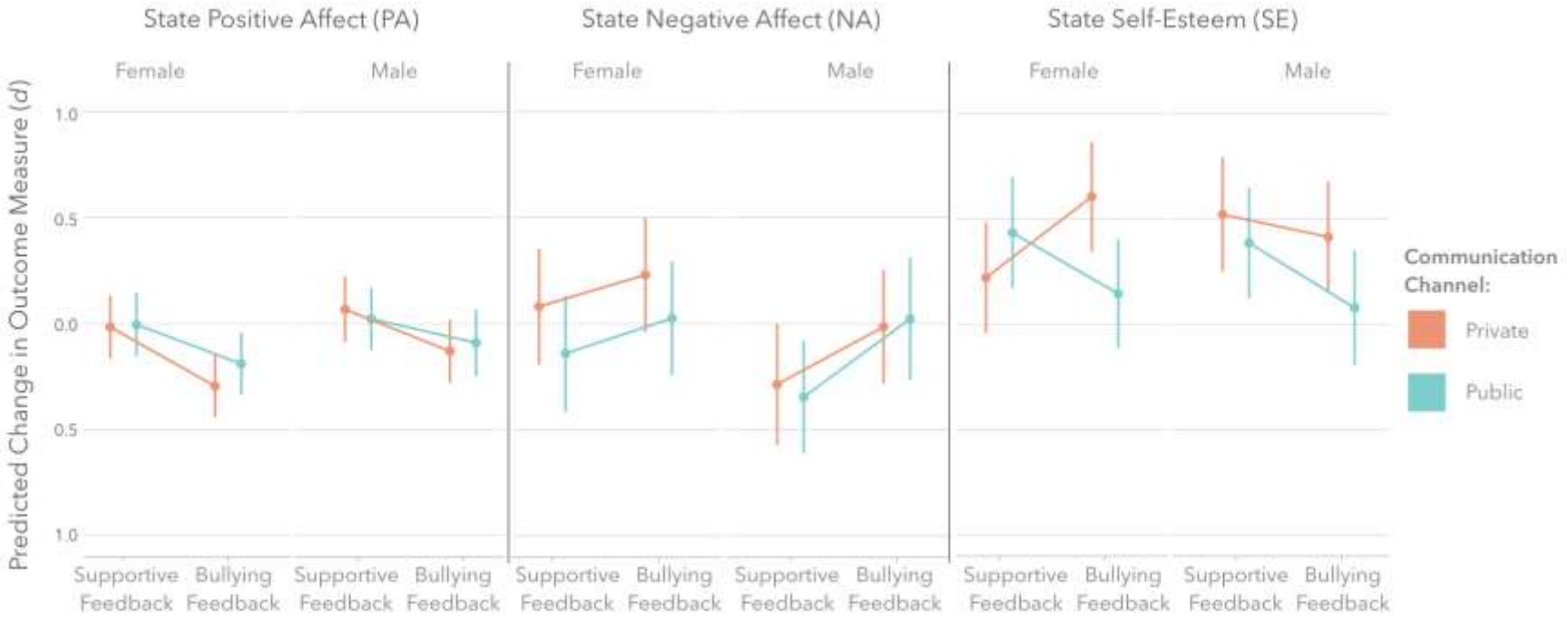


Figure 11: Results from Study 3: Gender.

Predicted standardized mean change, or effect size (d), in affect and self-esteem for male and female participants receiving supportive or bullying feedback as a function of feedback channel. Error bars represent 95% confidence intervals. There was no appreciable main effect of gender on any of the outcome variables, and gender had no appreciable moderating effect on any of the experimental factors (*p*s>.100).

Table 30: Unstandardized and Standardized Regression Coefficients for Moderating Effect of Gender on Experimental Variables in Study 3

	Response Variables																	
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE)					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
Gender (Intercept)	-0.43	-2.70	1.87	-0.02	-0.15	0.11	0.48	-0.67	1.65	0.05	-0.07	0.18	-0.07	-3.64	3.52	0.00	-0.14	0.14
Belief in Manipulation (Slope)	-1.12	-2.07	-0.17	-0.06	-0.12	-0.01	-0.23	-0.81	0.35	-0.03	-0.09	0.04	3.77	2.83	4.74	0.15	0.11	0.19
Time	-0.13	-0.68	0.42	-0.01	-0.07	0.04	0.01	-0.32	0.35	0.00	-0.06	0.07	0.52	-0.04	1.06	0.04	0.00	0.07
Gender (Slope)	1.32	-0.62	3.23	0.04	-0.02	0.09	-0.86	-2.06	0.34	-0.05	-0.11	0.02	-0.02	-1.98	1.98	0.00	-0.04	0.04
Feed. Chann.	0.39	-1.51	2.28	0.01	-0.04	0.07	-0.47	-1.62	0.68	-0.03	-0.09	0.04	-1.94	-3.86	0.01	-0.04	-0.07	0.00
Feed. Val.	-2.72	-4.64	-0.74	-0.08	-0.13	-0.02	1.01	-0.20	2.18	0.06	-0.01	0.12	-0.86	-2.85	1.13	-0.02	-0.06	0.02
Feed. Chann. * Gender	-0.85	-4.67	3.00	-0.01	-0.07	0.04	0.85	-1.48	3.22	0.02	-0.04	0.09	-1.21	-5.12	2.65	-0.01	-0.05	0.03
Feed Val. * Gender	1.08	-2.80	4.99	0.02	-0.04	0.07	0.68	-1.65	3.00	0.02	-0.04	0.08	-2.74	-6.71	1.13	-0.03	-0.06	0.01
Feed. Chann. * Feed. Val	1.25	-2.61	5.08	0.02	-0.04	0.07	0.24	-2.06	2.57	0.01	-0.06	0.07	-4.70	-8.50	-0.87	-0.05	-0.08	-0.01
Feed Chann. * Feed Val. * Gender	-0.14	-8.07	7.50	0.00	-0.06	0.05	0.34	-4.45	5.15	0.00	-0.06	0.07	5.09	-2.77	12.92	0.02	-0.01	0.06

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), Beta=standardized regression coefficients; Feed. Chan.=Feedback channel; Feed. Val.=Feedback Valence; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

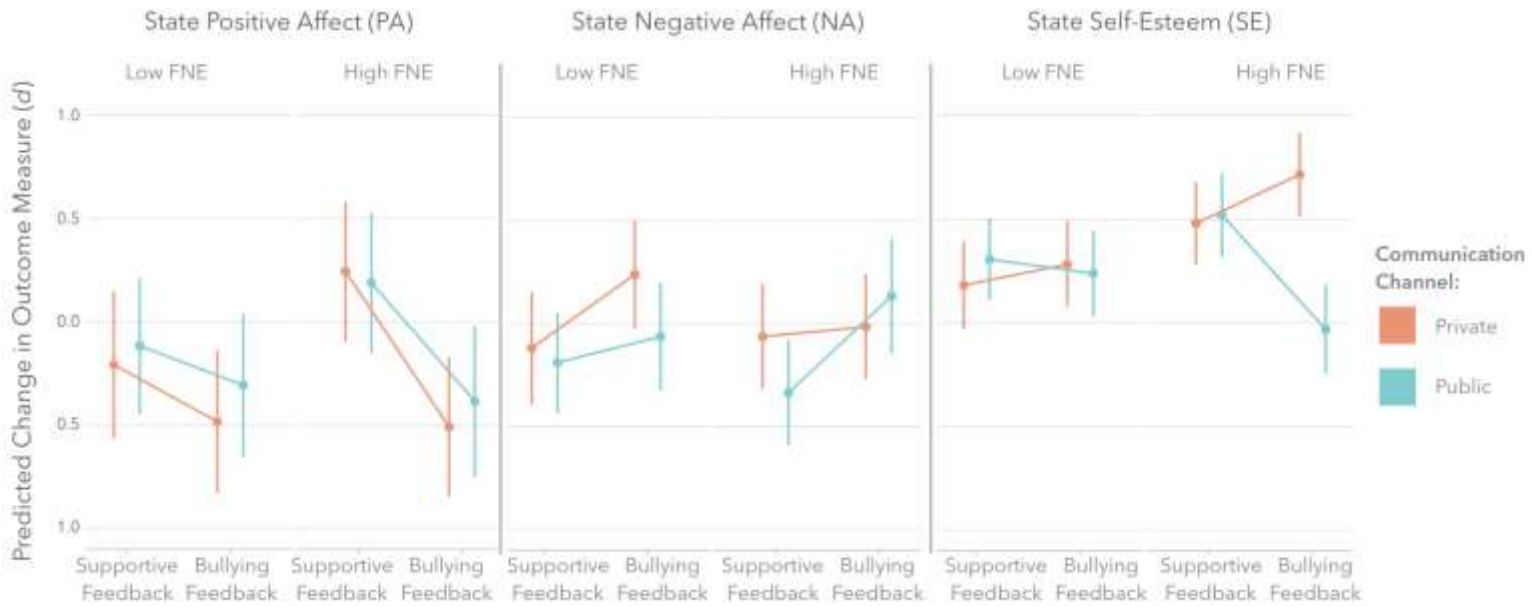


Figure 12: Results from Study 3: Fear of negative evaluation.

Predicted standardized mean change, or effect size (d), in affect and self-esteem for participants with fear of negative evaluation scores one standard deviation above and below the sample mean receiving supportive or bullying feedback as a function of feedback channel. Error bars represent 95% confidence intervals. Regardless of group, participants with high FNE reported larger post-manipulation increases in SE than participants with low FNE. FNE further moderated the effect of feedback channel on self-esteem change (p<.050); participants with high FNE who received private feedback reported greater overall increases in SE than participants with low FNE. There was no appreciable main effect of FNE on feedback channel for PA or NA, nor on feedback valence for any of the outcome variables (ps>.100). FNE did not moderate the interaction between feedback valence and feedback channel for any of the outcome variables (ps>.100).

Table 31: Unstandardized and Standardized Regression Coefficients for Moderating Effect of Fear of Negative Evaluation on Experimental Variables in Study 3

	Response Variables																	
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE)					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
FNE (Intercept)	-0.12	-0.23	-0.01	-0.14	-0.26	-0.01	0.16	0.11	0.21	0.36	0.25	0.46	-0.84	-0.97	-0.72	-0.67	-0.72	-0.60
Belief in Manipulation (Slope)	-1.18	-2.12	-0.23	-0.07	-0.12	-0.01	-0.22	-0.80	0.37	-0.02	-0.09	0.04	3.63	2.68	4.57	0.14	0.10	0.18
Time	-0.12	-0.68	0.43	-0.01	-0.07	0.04	0.02	-0.31	0.35	0.00	-0.06	0.07	0.39	-0.16	0.92	0.03	-0.01	0.06
FNE (Slope)	0.05	-0.04	0.14	0.03	-0.03	0.08	-0.01	-0.06	0.05	-0.01	-0.07	0.06	0.09	-0.01	0.19	0.04	0.00	0.07
Feed. Chann.	0.50	-1.39	2.46	0.01	-0.04	0.07	-0.52	-1.68	0.64	-0.03	-0.09	0.04	-1.69	-3.56	0.19	-0.03	-0.07	0.00
Feed. Val.	-2.69	-4.63	-0.74	-0.08	-0.13	-0.02	1.06	-0.13	2.23	0.06	-0.01	0.12	-0.75	-2.70	1.19	-0.01	-0.05	0.02
Feed. Chann. * FNE	-0.03	-0.22	0.16	-0.01	-0.06	0.05	0.03	-0.09	0.14	0.01	-0.05	0.08	-0.21	-0.40	-0.02	-0.04	-0.08	0.00
Feed Val. * FNE	-0.13	-0.32	0.06	-0.04	-0.09	0.02	0.00	-0.11	0.12	0.00	-0.06	0.07	-0.09	-0.28	0.09	-0.02	-0.06	0.02
Feed. Chann. * Feed. Val	0.79	-3.04	4.53	0.01	-0.04	0.07	0.40	-1.90	2.74	0.01	-0.05	0.08	-5.16	-9.00	-1.27	-0.05	-0.09	-0.01
Feed Chann. * Feed Val. * FNE	0.03	-0.36	0.40	0.00	-0.05	0.06	0.14	-0.09	0.37	0.04	-0.03	0.11	-0.33	-0.72	0.05	-0.03	-0.07	0.00

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), Beta=standardized regression coefficients; Feed. Chan.=Feedback channel; Feed. Val.=Feedback Valence; FNE=Fear of Negative Evaluation as measured by the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983); State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

Depressive Symptoms

Regardless of their assigned experimental condition, Pre-manipulation levels of depression as indexed by the BDI were associated with greater pre- to post-manipulation change in SE, b=7.05 [2.86, 11.13], $t(19)$=3.17, p<.005, d=1.00 [0.32, 1.68]. Moreover, BDI scores also moderated the effect of feedback channel on self-esteem change (p<.050), such that SE increased for participants with high BDI only for those in the private feedback conditions. Participants with high BDI who received private feedback reported large increases in SE, b=10.25 [4.26, 14.92], $t(11)=3.63$, p<.005, d=1.48 [0.53, 2.44], whereas participants with low BDI reported no appreciable increase in SE (p>.100). BDI also moderated the effect of feedback valence on PA change (p<.050). Follow up tests showed that high BDI participants who received acceptance feedback reported greater increase in PA than low BDI participants, although the effect was not significant (p=.067). There was no appreciable main effect of BDI on feedback channel for PA or NA, nor on feedback valence for NA or SE (ps>.100).

As hypothesized, BDI moderated the interaction between feedback channel and feedback valence on SE (p<.050). Participants with high BDI reported increases in SE (ps<.050) regardless of condition save those who received public rejection feedback (p>.100). These participants reported no appreciable increase in SE, suggesting that they were more influenced by bullying feedback than their peers in the private bullying condition. BDI did not moderate the interaction of the experimental variables for PA or NA (ps>.100). Figure 13 presents standardized mean change, or effect size of change (d), in state self-esteem for the four experimental groups for high and low BDI, and Table 32 presents unstandardized betas and effect sizes with bootstrapped 95% CIs (n=10,000) for the hypothesized moderation model for each of the three outcome variables..

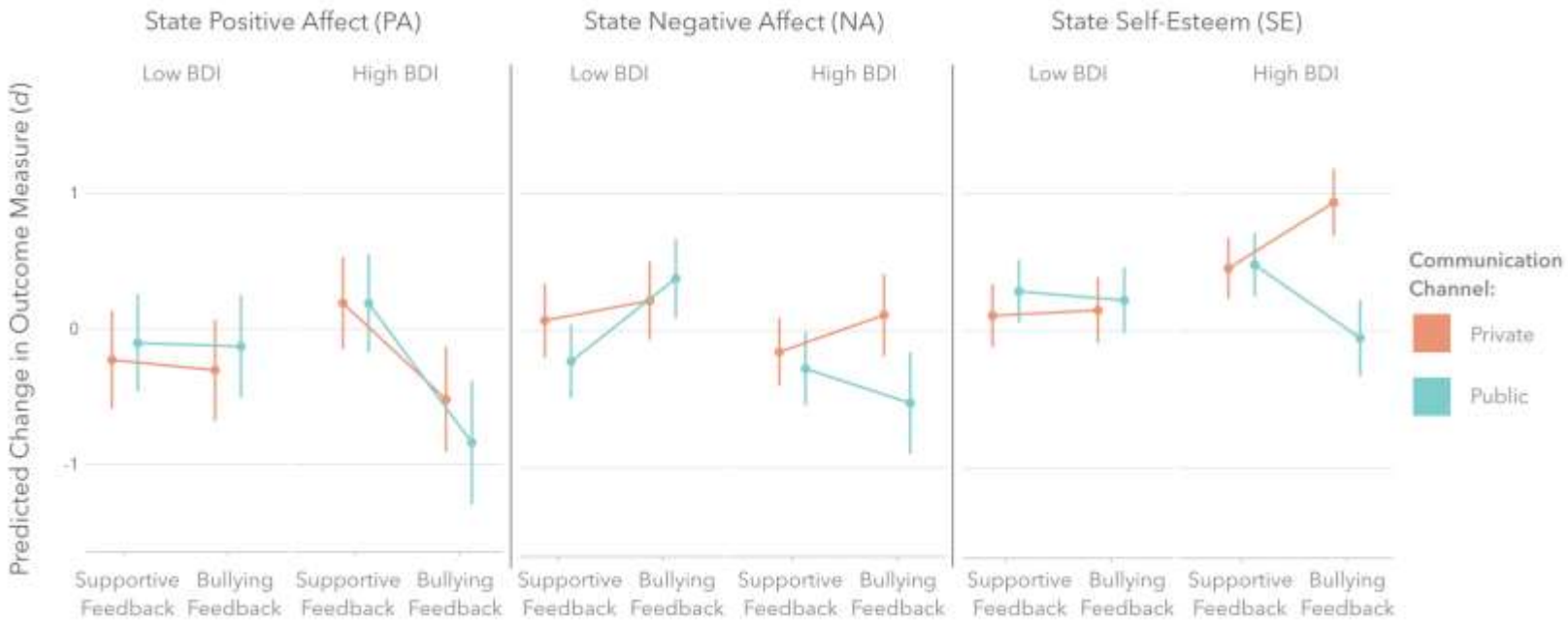


Figure 13: Results from Study 3: Depressive symptoms.

Predicted standardized mean change, or effect size (d), in affect and self-esteem for participants with depressive symptoms one standard deviation above and below the sample mean receiving supportive or bullying feedback as a function of feedback channel. Error bars represent 95% confidence intervals. Participants scoring high on the Beck Depression Inventory (BDI; 1 *SD* above the mean) reported increases in SE, whereas those low on the BDI (1 *SD* below the mean) reported no appreciable increase (p>.100). BDI further moderated the effect of feedback channel on SE (p<.050): private feedback qualified the overall increase in SE among those with high BDI. Participants with high BDI who received private feedback reported large increases in SE, whereas those with low BDI reported no appreciable increase (p>.100). BDI also moderated the effect of feedback valence on PA (p<.050), although follow-up tests were inconclusive (p<.100). There was no appreciable main effect of BDI on feedback channel for PA or NA, nor on feedback valence for NA or SE (ps>.100). BDI moderated the interaction between feedback channel and feedback valence on SE (p<.050); participants with high BDI reported increases in SE (ps<.050) regardless of condition, save those who received public rejection feedback, who reported no appreciable increase (p>.100). BDI did not moderate the interaction of the experimental variables for PA or NA (ps>.100).

Table 32: Unstandardized and Standardized Regression Coefficients for Moderating Effect of Depressive Symptoms on Experimental Variables in Study 3

Response Variables																		
Predictor	State Positive Affect (PA)						State Negative Affect (NA)						State Self-Esteem (SE)					
	b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]			b [95% CI]			beta [95% CI]		
BDI (Intercept)	-0.05	-0.22	0.13	-0.04	-0.17	0.10	0.29	0.22	0.37	0.43	0.33	0.52	-1.04	-1.25	-0.82	-0.54	-0.63	-0.45
Belief in Manipulation (Slope)	-1.31	-2.28	-0.35	-0.08	-0.13	-0.02	-0.21	-0.81	0.42	-0.02	-0.09	0.05	3.51	2.55	4.52	0.14	0.10	0.18
Time	-0.02	-0.56	0.54	0.00	-0.06	0.06	0.02	-0.33	0.37	0.00	-0.06	0.07	0.49	-0.06	1.04	0.03	0.00	0.07
BDI (Slope)	-0.02	-0.19	0.15	-0.01	-0.07	0.06	-0.10	-0.20	0.01	-0.07	-0.15	0.01	0.20	0.04	0.37	0.05	0.01	0.10
Feed. Chann.	-0.03	-2.02	1.98	0.00	-0.06	0.06	-0.95	-2.23	0.27	-0.05	-0.12	0.01	-1.92	-3.85	0.09	-0.04	-0.07	0.00
Feed. Val.	-2.77	-4.76	-0.82	-0.08	-0.14	-0.02	0.81	-0.46	2.07	0.04	-0.03	0.11	-0.21	-2.23	1.76	0.00	-0.04	0.03
Feed. Chann. * BDI	-0.13	-0.47	0.20	-0.03	-0.09	0.04	-0.10	-0.31	0.12	-0.04	-0.11	0.04	-0.47	-0.80	-0.13	-0.06	-0.11	-0.02
Feed Val. * BDI	-0.36	-0.69	-0.03	-0.07	-0.14	-0.01	-0.11	-0.31	0.09	-0.04	-0.12	0.04	-0.01	-0.34	0.32	0.00	-0.05	0.04
Feed. Chann. * Feed. Val	-0.80	-4.79	3.14	-0.01	-0.07	0.04	-0.13	-2.54	2.37	0.00	-0.07	0.06	-6.02	-9.99	-2.09	-0.06	-0.10	-0.02
Feed Chann. * Feed Val. * BDI	-0.16	-0.82	0.50	-0.02	-0.08	0.05	-0.30	-0.71	0.11	-0.06	-0.13	0.02	-0.71	-1.38	-0.05	-0.05	-0.09	0.00

b=unstandardized regression coefficients; 95% CI=bootstrapped confidence interval (*n*=10,000), Beta=standardized regression coefficients; Feed. Chan.=Feedback channel; Feed. Val.=Feedback Valence; BDI=Depressive symptoms as measured by the Beck Depression Inventory; State Positive Affect measured by the Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Negative Affect measured by the Negative Affect Subscale of the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark & Tellegen, 1988); State Self-Esteem measured by the State Self-Esteem Survey (SSES; Heatherton & Polivy, 1994)

Results Summary

In a moderation analysis of the results found in Study 2, we found that fear of negative evaluation and depressive symptoms both moderated participants' reactivity to feedback; gender did not. As a reminder, in Study 2, we found participants reported an overall increase in SE following the feedback manipulation – likely the result of the supportive and neutral feedback delivered by most of the confederates in the manipulation. Study 3 indicated this increase in SE was only reported by participants with high FNE or BDI. Participants with high fear of negative evaluation (FNE, 1 SD above the mean) reported greater post-manipulation increases in SE after private feedback than participants with low FNE (1 SD below the mean). Most participants with high BDI reported large increases in SE after feedback except those who received private rejection feedback, who reported no appreciable increase in SE after feedback.

DISCUSSION

To understand whether certain groups are more reactive to public or private Facebook-mediated bullying feedback, we conducted moderator analyses on the dataset from Study 2. Fear of negative evaluation (FNE), a risk factor for social anxiety, and depressive symptoms (BDI) both interacted with the experimental factors to moderate reactivity to feedback. Both participants with high FNE and high BDI qualified the overall post-manipulation increase in SE reported by participants, suggesting that these participants were more reactive to peer feedback, which was largely supportive or neutral, than their peers.

Participants with high depressive symptoms qualified the interaction between feedback channel and feedback valence on SE in Study 2. Unlike their peers, who reported a self-esteem boost after the feedback manipulation regardless of group assignment,

participants with high BDI reported no self-esteem boost after public bullying feedback, suggesting a particular sensitivity to public negative feedback. Participants with high BDI who received private bullying feedback were not similarly affected.

Women are more reactive to private rejection feedback than are men (Romero-Canyas & Downey, 2005), and they anticipate stronger negative reactions to rejection than men do (Reijntjes, Stegge & Terwogt, 2006). We tested whether women were more reactive to private bullying feedback than men, but found no appreciable difference in reactivity to feedback between male and female participants.

Social anxiety symptoms predict emotional reactivity in response to rejection (Reijntjes, Dekovic, & Telch, 2007; Reijntjes et al., 2011), and socially anxious people often have exaggerated fears of negative evaluation. We tested whether fear of negative evaluation, a risk factor for social anxiety (Friend & Gilbert, 1973; Smith & Sarason, 1975; Watson & Friend, 1969), predicted heightened reactivity to public peer feedback. We found that high FNE predicted increased reactivity to peer feedback overall, with high FNE participants reporting greater increases in SE after the feedback manipulation relative to low FNE participants. This effect was more pronounced for those who received private, as opposed to public, feedback. Examination of Figure 12 suggests this may be because high FNE participants who received public bullying feedback did not report an increase in SE, although the interaction effect between FNE, feedback valence, and feedback channel was not significant ($p<.150$).

Children with depressive symptoms anticipate more distress when imagining a rejection scenario (Reijntjes, Stegge & Terwogt, 2006). We tested whether depressive symptoms predicted heightened reactivity to public feedback. We found that, similar to participants with high FNE, participants with high BDI reported increased reactivity to peer feedback overall. High BDI participants reported overall increases in SE after the feedback

manipulation, which was largely supportive. However, high BDI participants who received public bullying feedback from one confederate did not report any appreciable increase in SE, suggesting that public bullying feedback, but not private bullying feedback, had a dampening effect on SE.

Understanding moderators of emotional reactivity to Facebook-mediated feedback is important because it may suggest meaningful targets for intervention. Up to 23% of adolescents may be victims of cyberbullying (Schneider, O'Donnel, & Smith, 2015), which is associated with anxiety (e.g., Dempsey, Sulowski, Nichols & Storch, 2009), reduced self-esteem (e.g., Houlston, Smith & Jessel, 2011; Patchin & Hinduja, 2010), and depression (e.g., Sontag, Clemens, Graber & Lyndon, 2011; Ybarra, 2004). In the wake of highly-publicized teen suicides, some have questioned whether social media platforms like Facebook have made cyberbullying easier for perpetrators and more damaging to its victims (Arkell, 2013; Gayle, 2013). However, our research suggests that the public nature of Facebook may not itself be more damaging to victims. Our findings suggest that cyberbullying interventions might best target children with existing depression or social anxiety, as they may be at higher risk.

General Discussion

Introduction

The three studies presented here suggest that feedback channel and psychosocial variables influence reactivity to Facebook-mediated peer feedback. In Study 1, participants reported similar levels of emotional reactivity to private rejection feedback, regardless of whether it was Facebook-mediated or face-to-face. In Study 2, participants reported self-esteem reactivity to bullying on their Facebook Profile, a semi-public space, but not to bullying delivered privately through Facebook Messenger. In Study 3, we found that reactivity to feedback was more pronounced in participants who reported high depressive symptoms or high levels of fear of negative evaluation. Participants with high depressive symptoms in particular reported the strongest reaction to public bullying feedback.

Interpretation of all findings and significance

The results of these three studies contribute to multiple streams of research investigating the psychosocial effects of peer feedback. Literature on perceived control, attributional styles, and self-esteem all suggest that Facebook-mediated communication should reduce reactivity to peer feedback compared to face-to-face feedback (Study 1). Research on social comparison and peer victimization, along with the aforementioned areas of study, suggest that public Facebook-mediated feedback should prompt more reactivity than private Facebook-mediated feedback (Study 2). Finally, peer feedback research on women, people with high fear of negative evaluation, and people with depressive symptoms would all suggest that these groups should be more reactive to peer feedback than their peers (Study 3).

We hypothesized that people should be more reactive to face-to-face evaluation and feedback than to Facebook-mediated evaluation and feedback because Facebook-mediated communication affords more self-presentational control than face-to-face communication. Psychological theory (e.g., Averill, 1973; Bandura, 1988; Dweck & Leggett, 1988) and

experimental research (Sanderson, Rapee & Barlow; 1989; Telch et al., 1994) both suggest perceived control reduces emotional reactivity. Because Facebook-mediated communication affords self-presentational control that face-to-face interaction does not, for instance, asynchronous responding and selective self-presentation, we expected people would be less reactive to feedback about Facebook self-presentation than to feedback about face-to-face self-presentation.

Contrary to what the literature on perceived control and attribution theory would suggest, we did not find that reactivity to Facebook-mediated evaluation or feedback appreciably differed from face-to-face evaluation or feedback (Study 1). This may be because Facebook plays an equally important role in people's social lives as face-to-face interaction – making evaluation and feedback of one's Facebook Profile as emotionally salient as face-to-face evaluation and feedback. People may also not actually feel more in control of their Facebook identity than face-to-face identity – because we did not measure perceived control during the study, we are unable to test whether that mediated the effects we found. Our experimental manipulation, in which research confederates provided feedback, may also not have felt socially relevant enough to elicit strong reactivity from any group. Or, lastly, our sample may have been too small to detect differences between groups. In both experiments, there was evidence that face-to-face evaluation and feedback prompted greater self-esteem reactivity, but those effects were not statistically significant ($p<.100$). Our samples may have been too small to be able to detect such effects. Additional research using larger samples and feedback that is more personal in nature may help clarify whether Facebook dampens reactivity to peer feedback.

Because people have less control over the diffusion of public information, the semi-public nature of Facebook Profiles could potentially increase reactivity to feedback, a hypothesis supported by Study 2. People are more concerned about public self-presentation than private self-presentation (Leary & Kowalski, 1990), and react more strongly to public feedback than they do to private feedback (Leary, Cottrell, & Phillips, 2001). Because peer

feedback posted on users' Facebook Profiles is often visible to those users' social networks, people may anticipate that such feedback could have greater social consequences than feedback shared privately through Facebook's messaging channel, where only the sender and receiver can see it (Kowalski & Limber, 2007; Nocentini et al., 2010). People further may feel less control over public peer feedback as they may not be able to manage information diffusion (Sticca & Perren, 2012). In Study 2, we indeed found that public bullying feedback had a stronger effect on participants' emotional reactivity than private bullying feedback, and we additionally found that participants expected social consequences for the bully. Both results suggest that participants expected their peers would see the public bullying content, and that they expected the bullying content to affect their opinions of them and of the bully.

Research on self-esteem and Facebook use suggest an individual's Facebook Profile may help people regulate their self-esteem. Some researchers have found that Facebook Profile visits increase self-esteem after social rejection (Toma & Hancock, 2013; Toma, 2014; Gonzales & Hancock, 2011). However, Profile views could also damage self-esteem if one's Profile is defaced (as is the case when cyberbullies post negative content onto a victim's Facebook Profile). Study 1, which found no appreciable difference between Facebook-mediated and face-to-face evaluation and feedback, does not suggest that Facebook, as a platform beyond the Facebook Profile, is especially emotionally affirming. However, Study 2, which found that bullying feedback shared publicly on someone's Facebook Profile, but not shared privately via Facebook Messenger, reduced self-esteem, potentially supports the idea that the Facebook Profile could be an important space for self-esteem regulation.

Research on online social comparison indicates that people who compare themselves to others when using Facebook report more depressive symptoms and more negative self-views (Feinstein et al., 2013; Haferkamp & Krämer, 2011) compared to peers. We expected our experimental manipulations to prompt social evaluative concerns and, as

a result, to generally prompt negative emotional reactivity amongst participants. However, this was largely not the case and, in fact, our manipulations were more likely to have a positive effect on emotional reactivity. However, in Study 3 we found that people with symptoms of social anxiety or depression were more reactive to bullying feedback. This is consistent with research indicating they are more likely to judge themselves inferior to others, and to experience more negative emotional reactivity after making that judgment (Antony et al., 2005; Bäzner, Brömer, Hammelstein, & Meyer, 2006). Although we did not measure social comparison in our research, Studies 2 and 3 may inform future studies considering Facebook-mediated social comparison. Specifically, public feedback may have prompted more emotional reactivity amongst participants with fear or negative evaluation and depressive symptoms because these populations may be more vigilant about their self-presentation. Public feedback, which could potentially influence countless others' evaluations, would therefore be more salient than private feedback.

In Study 3 we found that depressive symptoms and fear of negative evaluation overall increased self-esteem reactivity to peer feedback regardless of feedback valence. Specifically, the feedback manipulation appeared to increase self-esteem for all conditions. We considered whether this could have been an effect of regression towards the mean, given that participants with high depressive symptoms or high fear of negative evaluation are likely to report low self-esteem. However, two pieces of evidence indicated this was an effect of reactivity to the manipulation, and not regression towards the mean. First, participants with low depressive symptoms or fear of negative evaluation did not similarly report a drop in self-esteem, which would be expected if self-esteem reactivity were the result of regression. Second, participants with high depressive symptoms who received public bullying feedback did not report an increase in self-esteem as did the other three groups, indicating reactivity to the manipulation rather than regression.

These three studies make a particular contribution to the growing literature on cyberbullying. Up to 23% of adolescents may be victims of cyberbullying (Schneider,

O'Donnel, & Smith, 2015) and its psychosocial correlates can be severe, including anxiety (e.g., Dempsey, Sulowski, Nichols & Storch, 2009), reduced self-esteem (e.g., Houlston, Smith & Jessel, 2011; Patchin & Hinduja, 2010), and depression (e.g., Sontag, Clemens, Graber & Lyndon, 2011; Ybarra, 2004). Consistent with perceptions that public bullying is more harmful than private bullying, whether face-to-face (Slonje & Smith, 2008; Nocentini et al., 2010) or online (Sticca & Perren, 2012), Study 2 found that public bullying is worse than private bullying. Further, Study 3 provides experimental evidence supports correlational studies suggesting that bullying victims with social anxiety or depression are particularly vulnerable to negative outcomes associated with public bullying on Facebook (Kowalski & Limber, 2013).

Although Study 1 did not find that Facebook reduced self-esteem reactivity to feedback, other factors relevant to traumatic experiences of peer victimization – including repetition, familiarity with perpetrators, number of perpetrators, and ubiquity (Patchin & Hinduja, 2006) – which were not applicable to our feedback manipulation, could differentially influence reactivity to online and face-to-face peer rejection. Because Facebook-mediated peer victimization can occur more frequently than face-to-face victimization, the aggregate effect of Facebook-mediated rejection could dwarf the effect of face-to-face rejection, although that is not something we evaluated in any of our studies.

LIMITATIONS

Our three studies investigated self-reported emotional reactivity of a stranger's feedback on university students. The majority of peer victimization research focuses on middle childhood, when peer victimization is most prevalent (Carlyle & Steinman, 2007) and effects of our studies may have been larger had they been testing in a younger population. Further, because our study focused on university students specifically, there may be other protective factors influencing their reactivity to our feedback manipulation, like education level and technological sophistication. It's possible that students with less

education or access to technology might react differently to computer-mediated peer feedback.

While our manipulation provides some evidence about how peer feedback affects emotional reactivity, we did not manipulate other factors likely to influence reactivity to feedback, including frequency of feedback, anonymity, relational closeness to feedback source, number of feedback sources, repetition of feedback, use of multiple feedback channels, and duration of feedback. For example, because our manipulation used strangers to deliver feedback, we cannot make inferences about cyberbullying by known peers or even friends, which would be expected to cause more emotional reactivity. We were also limited in the content of the feedback we could deliver, particularly for Studies 2 and 3. Because our sample is highly educated, they were naturally skeptical about any research activity in a Psychology department. As a result, we had to ensure our bullying feedback was believable, which meant that it wasn't too extreme. Further, because we were using standardized bullying content for every participant, we could not focus on specific features of a given participant – like their appearance, interests, background, or preferences -- which would be expected to potentially increase reactivity to feedback (and are more consistent with actual bullying feedback).

Lastly, we used self-report baseline and post-manipulation assessments to measure emotional reactivity to feedback. Behavioral measures of reactivity, such as psychophysiological measures, would be a better gauge of emotional reactivity in future studies. Additionally, qualitative prompts following each manipulation could have provided insights into potential moderators and mediators of reactivity, which could inform future studies.

FUTURE DIRECTIONS

A number of potential moderators and mediators that could explain the findings in Studies 2 and 3 should be considered in future research. People highly concerned with social comparison, for example, may be more reactive to public bullying feedback than their peers. Social comparison behaviors during the study, like visiting others' Facebook Profiles, could influence emotional reactivity as well. Visiting the Profile of a person with greater social status (an upward comparison) could increase reactivity to feedback, while visiting the Profile of a person with less social status (a downward social comparison) could potentially decrease reactivity. Further, because research suggests self-Profile views may increase self-esteem, Profile viewing could mediate the effects of feedback on self-esteem reactivity.

Because our research sample consisted of highly-educated Psychology undergraduates, we made our rejection or bullying feedback relatively benign, to facilitate the believability of the study. Study designs that could employ more negative peer feedback, while still being believable to students, may be both more ecologically valid and provide more insights into the effects of peer victimization. In future studies, the dose, severity, degree, frequency, or number of sources of feedback could all be manipulated to further understand the relationship between feedback and reactivity.

IMPLICATIONS

Our results have potential implications for the intervention and treatment of cyberbullying. Parents, teachers, and clinicians may want to focus interventions on students with depressive symptoms or fear of negative evaluation, as these students are the most likely to exhibit reactivity to bullying feedback. Additionally, companies like Facebook may focus their efforts to prevent cyberbullying on the reduction of public bullying content. Websites like Facebook could consider identifying potentially bullying content, and prompting the author to reconsider the content before publication. Such sites could also

prompt the targeted user to approve any posts including their name or Profile prior to publication, although that has the negative effect of constraining free speech. Websites could also consider downranking, nesting, or otherwise using design to minimize content likely to be harmful. Future research investigating the influence of factors like repetition, familiarity with perpetrators, number of perpetrators, and ubiquity, as well as investigating potential mediators such as perceived control and social comparison, could help organizations develop targeted interventions that could save children's lives.

Appendices

Table A1: Face-to-face interview evaluation script for Study 1

One research assistant (RA) read the introductory text and timed the interview using a stopwatch. RAs took notes on participants' answers to provide a realistic reason to pause between each question and ensure the interview would last at least five minutes. After five minutes had elapsed, the RAs concluded the interview and the experimenter returned the participant to his or her private assessment room. **RA:** Hi, thanks for coming in. We're conducting a brief interview to get to know you better. We'll be asking some general questions about you. First, the RAs and I are going to introduce ourselves and then we'll move on to the questions we have for you. Feel free to say as much or as little as you want, but you don't have to answer anything you don't want to answer. We've only got five minutes to speak, and we have a lot of questions, so if you don't find something interesting or relevant, just let us know so we can move on. We're trying to get to know you in as quick a time as possible, so it's okay to answer very briefly or even to skip a question if you don't find it interesting. RA introductions: name, major, current city, home town, job, birth date **RA:** What is your full name? Where do you work? What day is your birthday? What is your major? What city do you live in? What languages do you speak? Where are you from? What's the most memorable thing you recently shared using the internet? Why did you share {describe item}? Do you remember when you shared that? Are there any other things you recently shared on the internet that you found interesting? {If applicable} Can you briefly tell us more about your work? What class are you in here at UT? What other schools have you attended? How would you describe your religious views? How would you describe your political views? Do you have any favorite quotes or sayings? {If yes & they don't describe} Can you tell us the saying? Do you have any favorite sports teams? {If yes & they don't describe} What are they? What about music?

{If yes & they don't describe} What do you like to listen to?
Any favorite books?
{If yes & they don't describe} What are they?
What about movies?
{If yes & they don't describe} Which ones?
Do you have any favorite television shows?
{If yes & they don't describe} Which ones?
Any favorite games?
{If yes & they don't describe} Which ones do you like to play?
Is there anything else about yourself that you'd like us to know?

Data Collection

Participants completed all measures on a desktop computer in a private assessment room in The Laboratory for the Study of Anxiety Disorders at The University of Texas at Austin. Assessments were conducted using online data collection service Qualtrics (Qualtrics.com).

Study 1, Experiment 1

Manipulation Check

Nearly all recruited participants (n=177, 97.25%) responded to a write-in item asking participants what they thought the study was about prior to debrief. Table A2 includes examples of participant beliefs about the true nature of the study at different levels of belief in the manipulation. A small number of participants reported that they had heard about the study from another participant prior to their participation (n=6, 3.29%), however, all of those participants (n=6, 100.00%) reported that they had not been informed of the true nature of the study.

Table A2: *Participant answers to the question, "*What did you believe that the purpose of this study was before the debriefing session?", at different levels of reported suspicion about the manipulation

0 (I was sure that the screeners were **not** rating me on likability)	To see if people would answer the survey questions differently once they were told that they were "likeable" based off of the judgements of the RAs I felt that it had something to do with my response to rejection but I thought I actually was rejected Having noticed something to the effect of 'anxiety research lab' on a sign I saw on my way here, I suspected that my reactions were being noted throughout the study, though I was unsure of the purpose
2 (*I was not sure whether the screeners were rating me on likeability*)	I had no idea whatsoever To judge my likeability to find out whether or not I qualified for another study to be honest, I had no idea ... Just wanted to get credit hours :)
4 (I fully believed that the screeners were rating me on likability)	To rate my likability I knew it had to do with Facebook from the title of the study, that's it To rate people's likability based off their Facebook profiles compared to their in person impression

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